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The AIRCRAFT ENGINEER AND AIRSHIPS

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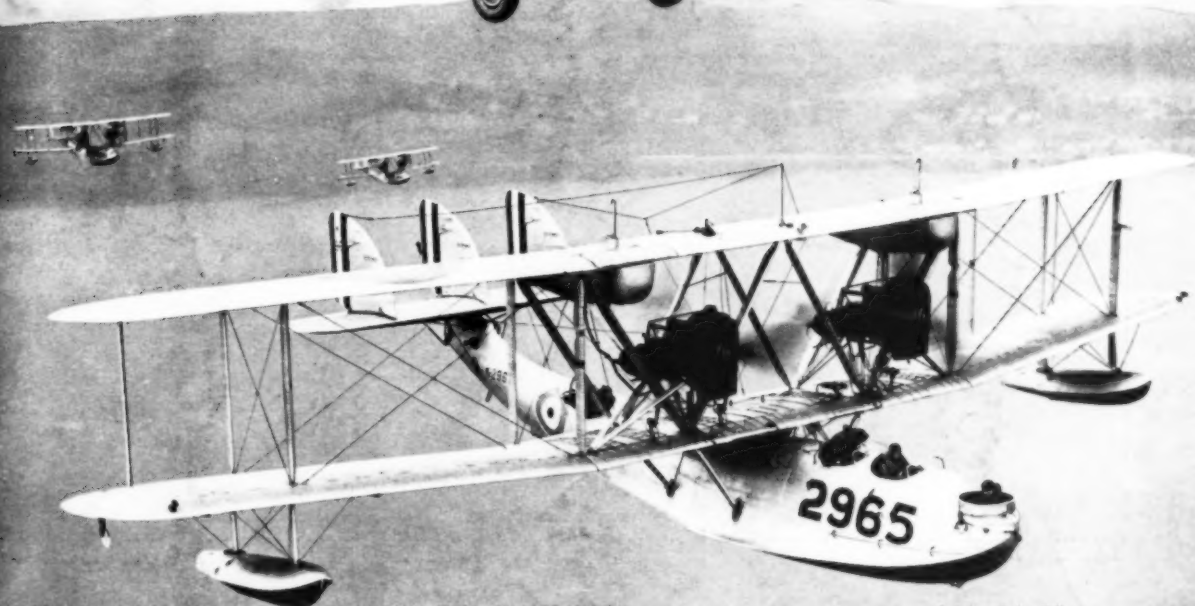

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The AIRCRAFT ENGINEER AND AIRSHIPS

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Expansive Shadows

FROM many points of view, it is regrettable that Lord Nuffield felt obliged to express his disagreement with the Government's air policy in the particular manner he did. It was inevitable that the whole of the daily press should make much of the matter, and equally inevitable that certain sections of it should take this opportunity to convey to the man in the street that the expansion of the R.A.F. is in danger of being jeopardised.

On the other hand, from the facts which have so far come to light, one is inclined to the view that Lord Nuffield's patriotic offers to assist in the production programme were not examined and treated with the tact which a man of his engineering resources was entitled to expect.

The general public could hardly comprehend the difference between the R.A.F. expansion scheme and the so-called "shadow industry" scheme, and the recent utterings have, if anything, tended to make confusion worse confounded, "expansion" and "shadow industry" having been used indiscriminately. Without going into great detail, it may be stated quite briefly that, as far as aero engines are concerned, the existing aero-engine firms are to take care of the expansion by increasing their output while two automobile firms are to form a "shadow industry" by establishing factories, at the Government's expense, in which a relatively small number of workers may be trained in the specialised work, so that, should war break out, a rapid increase of production can take place. Other automobile manufacturers have been formed into a group to produce aero-engine components on a specialised basis in Government-assisted factories.

A lot of nonsense has been written about a "ring" of aero-engine manufacturers alleged to exist merely for the purpose of maintaining high prices and keeping competitors out. It is but a few years ago that the four or five aero-engine firms which supplied the needs of the R.A.F. and of civil aviation had a very lean time. Certainly no useful purpose would be served, from a national point of view, by materially increasing the number of firms or types of engines.

When the need for expansion arose, and in fact before that, the Air Council examined the matter very thoroughly, in collaboration with the Service, and came to the conclusion that in time of emergency it would be impracticable to use in the R.A.F. a multiplicity of engine types. Problems of stores and maintenance would become too great. The alternative was to select a relatively few types, and to find means of having these manufactured in large quantities. Both Lord Nuffield and Mr. T. G. John of the Alvis company appear to disagree with the Air Ministry about the matter.

Economy of Types

Lord Nuffield's complaint that the Air Ministry gave him no encouragement may be explained by the fact that when he started aero-engine work at the Wolseley factory he began by producing an engine of low power, for which there was no real need in the R.A.F. The answer to Mr. John's complaint seems to be that he secured for his company the British rights of the French Gnome-Rhone engines, which in turn began life as French versions of the Bristol Jupiter but have since diverged completely from the original design. The Air Council's decision to keep down the number of engine types in service with the R.A.F. would no doubt rule out any possible adoption of British-built Gnome-Rhones.

In all fairness it might be urged that the refusal of the Air Ministry to order Bristol engines from outside sources at the same price as that charged by the Bristol company was not an unreasonable one. The Bristol firm has spent hundreds of thousands of pounds sterling on research and development work, and has

trained a wonderful personnel over a long period of years, and if that outlay is ever to be recovered, it must be through the price of production engines. Lord Nuffield knows from personal experience what a lengthy and costly process it is to introduce new aero-engine types.

The main issue of this unfortunate controversy has been completely clouded by numerous side issues. It is whether or not the manufacture of separate aero-engine components by a group of firms in the motor car industry is a practical proposition, or whether each of the firms should build complete engines.

Since every existing engine manufacturer to-day sub-contracts a considerable number of parts which in every case are subjected to the rigid A.I.D. inspection during production, many engineers consider that an extension of that system is a perfectly logical one. It is intended that most of the new firms will specialise upon components, and there will be a separate assembly plant under the supervision of the parent firm. On the other hand an engineer of Lord Nuffield's standing has many supporters when he avers so definitely that the scheme is not workable. The danger with the taxpayer in forming judgment is his entire inability to distinguish standards of engineering. Only experienced engineers can appreciate the meticulous care and the high-class workmanship and materials which are necessary to the successful production of aero engines.

The Air Ministry's view will be officially stated this afternoon. It is very much to be hoped that after the whole matter has been threshed out, the long series of misunderstandings (for that is really what they are) will be cleared up and full use made of the great resources of such a public-spirited and enterprising engineer as Lord Nuffield, and of others who may be brought into the industry to perform much-needed work of national importance.

Canopus Starts

ALL good wishes accompany the Imperial Airways flying boat *Canopus* on its journey from Rochester to the Mediterranean. She—for every marine craft is feminine, however masculine the name may sound—is the first of her class, and she and her twenty-four sisters are to open a new era in Empire communications. Their speed is an answer to the criticism that Imperial Airways are indifferent to hustle. Their number will make possible that multiplication of services which is almost as important as actual speed of flight, and, also ensures a single "gauge" throughout the Empire air scheme. Their class marks the triumph of the seaplane class over the landplane class for long trunk routes. Their fittings inaugurate the age of air sleepers on British lines, and provide a standard of comfort which would be a luxury on short flights but is a necessity when long stages have to be flown day after day and sometimes night after night. In every way this type of flying boat both deals with present needs and looks (so far as is possible in a business of such rapidly changing conditions) to the future.

When first an air mail to Karachi was established, the canny business men of India regarded it with profound suspicion, and if they ever entrusted a letter to its tender mercies, they always sent a duplicate by sea. Since then the air mail has won confidence and now carries the large majority of first-class mail matter. Duplicates are no longer thought necessary, and even an occasional loss of mail bags through an accident does not shake that confidence. With the greater speed and frequency of service which will be offered by the Empire-class boats, air mails to India, Australia, South Africa, and soon we hope to New Zealand, will still further establish their position as the foremost means of communication.

AFTER THE HARE: Apart from its touch of the picturesque, this photograph of local harriers meeting at Aldergrove R.A.F. station is interesting as showing machines of No. 502 (Ulster) (Bomber) Squadron and also in recalling the links between hunting and aviation, as expressed by such names as Handley Page Hare (which appeared just before the Heyford), Fairey Fox, Hawker Harrier, De Havilland Hound, Blackburn Beagle and Vickers Vixen.

The Outlook

A Running Commentary on Air Topics

Heston's Future

THE Government takes great credit to itself for the number of houses which have been built since it came into office, but there are times and places when and where building may be anything but a blessing. It certainly seems unfortunate that Airwork are selling twenty-six acres of ground to the east of Heston airport, and that speculative building will be the probable fate of this land. An extension of the aerodrome landing space on that side would be very welcome, if it were possible. The approach up the Lorenz beam is from that direction, but the objection to using it is that on that side the aerodrome is bounded by a paling and a public footpath, which apparently is a right of way. We believe that nothing less than an Act of Parliament can abolish a right of way, and if this path is immovable then there seems the less cause for regretting the probable building on that side. It would also seem that, in that case, the Lorenz beacons must be moved so as to offer a different line of approach. We are assured that, if building takes place, the height of the houses will be kept low enough to make landings from that direction safe when the visibility is good—as it usually is when there is an ordinary wind blowing.

At the same time, one must regret the disappearance of any chance of increasing the landing area of Heston. Croydon is getting overcrowded, and Heston now plays an important part as an alternative London terminus. It is by no means certain that the City's airport near Ilford will prove so useful as Heston has become. Fortunately, expansion to the south and north of the present landing ground is still a possibility, and we can only express the hope that something will be done about it.

R.A.F. Reorganisation

LAST week comment was made on this page on the absence of any fighter squadron in the Birmingham area. At present, Duxford, near Cambridge, is the only fighter aerodrome which lies at any distance from the inner circle round London. Duxford could, of course, take steps to interfere with raiders from the East who had designs on the cities of the Midlands. North of that point No. 41 (Fighter) Squadron, on its return from the Mediterranean area, has been stationed at Catterick in Yorkshire, previously occupied only by an A.C. squadron.

An extension of air defence measures to the North has just been announced. No. 607 (County of Durham) Squadron of the Auxiliary Air Force, which has hitherto been a bomber squadron, is to be converted into a fighter squadron on November 1. This is a move in the right direction, even though it diminishes the bombing strength of the Metropolitan Air Force. Fighting in the air is purely defensive work, and to be called upon to fight in defence of their own homes makes a strong appeal to officers and men of the A.A.F.

Another interesting innovation is also announced. A new Group is to be formed in the Coastal Command on December 1, which is to be known as No. 16 (Reconnaissance) Group, and will have its headquarters at Bircham Newton. It will comprise three general reconnaissance squadrons, five flying boat squadrons, and two torpedo-bomber squadrons. Reconnaissance is not exactly the work of torpedo-bomber squadrons; they are striking units, but they are certainly concerned with coastal work, and their inclusion is doubtless a convenience from the administrative standpoint.

Air Lifeboats

THE use of flying boats to pick up the survivors of the Dutch steamer *Van der Wijck*, which capsized in the Java Sea, has been claimed as the first instance of the sort. Possibly it is, though cognate cases of humanitarian work by seaplanes could be quoted. Flying boats have on occasions landed beside steamers and taken off hospital cases which had to be hurried to land. Such operations can only be carried out on calm seas. It was evidently quite calm where the Dutch steamer capsized. If the waves were turbulent enough to put the ship into distress the only help which the air could give would be to guide rescue vessels to the spot. That, in itself, might be a service which would save many lives, and in the future it may be expected that aircraft will give more and more help to seacraft. But the day of the actual flying lifeboat is not yet in sight.

"Never the Lotus Closes"

TWELVE years ago the British Empire Exhibition at Wembley gave many people some idea of the West African colonies and protectorates, but Wembley is now well-nigh forgotten, and few of the general public have any clear notions about Nigeria, Gold Coast, Sierra Leone and Gambia, or even about where they are. It would be interesting to know how many readers in this country turned to their atlases when it was announced that last Thursday *Daedalus* arrived at Lagos from Kano, and so opened Imperial Airways' weekly service from London *via* Khartum. Probably most of them did not bother; the names just indicated some "furrin parts."

The isolation of the West African colonies is just the point which makes the extension of the air service to the coast so very important. At one time part of the coast used to be called "White Man's Grave," and the tragedies of life there inspired the poem of Kipling from which the headline of this note is quoted. The only connection between West Africa and Home used to be by sea. The extension of the air service from Khartum to Kano in Nigeria some time ago made it possible for the white people there to get Home much more speedily than was possible by steamer. It also brought them into touch with all the amenities of Cairo. Now the service has been extended on to the coast, and that is another great boon. In time it is hoped that not only Nigeria but the smaller colonies as well will have an air link with East Africa and the British Isles.

Frequency and *Speed*

TIME after time it has been urged by various people, ourselves included, that frequency is almost as important as speed in the matter of airline operation, and it is interesting to discover exactly what the new Empire schedule will do for passengers, and, more important still, for air-mail users.

At present, for instance, two services are run to India, Singapore and Australia every week, each service to India taking a matter of six days. In due course the number to India will be increased to four or five, and the time will be reduced to four days; there will be three services to Singapore, each taking five and a half days; and the present idea is to reduce the Australian schedule to one of seven days. In other words, practically every day will be an air-mail day. The convenience to business houses will be difficult to exaggerate.

THE SHORT E

A Complete Description : Passenger Accommodation : Piloting and Navigational Equipment : The Bristol Pegasus Xc Engines

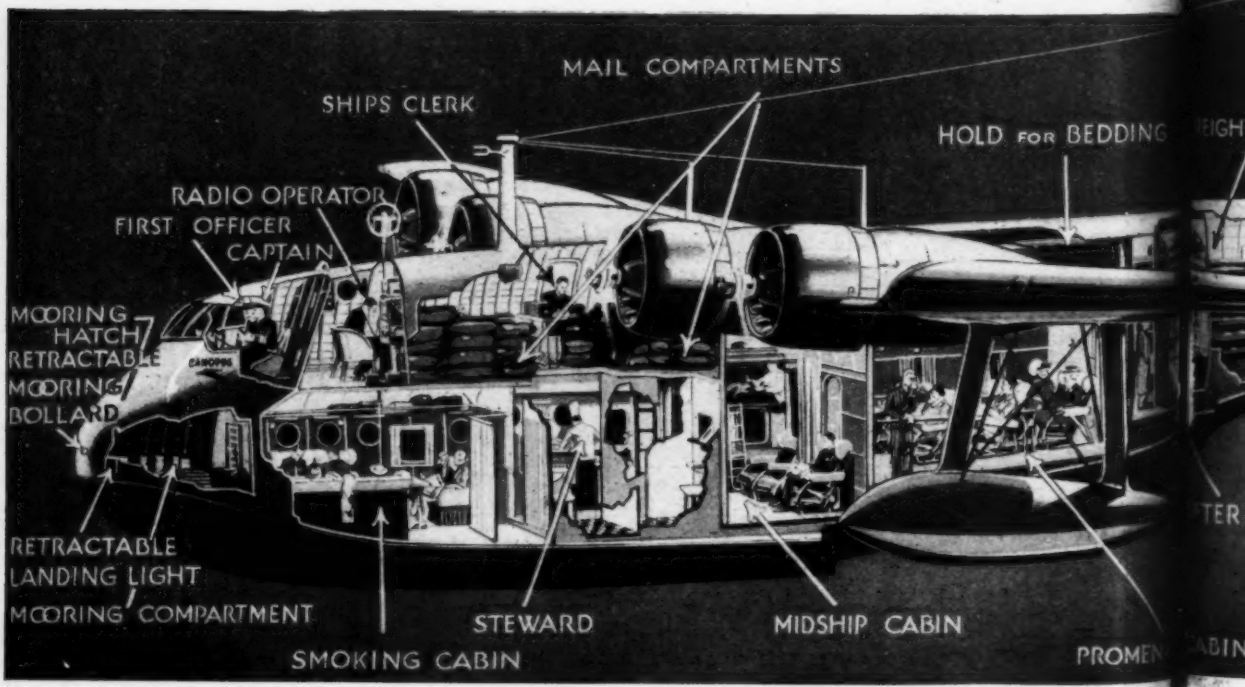
(Constructional details appear in "The Aircraft Engineer" Supplement to this issue)

IF evidence were needed that the Short Empire flying boat is a new departure, the writer of these notes could give it, for in setting out to describe the machine it is difficult to decide on a plan. Not only are there several cabins, but the two decks are added complications from a descriptive viewpoint. Gone are the days of "behind the pilots' cockpit is the passenger cabin, with a luggage compartment at the rear." One feels that the time has come to turn up the technical shipbuilding journals and to study their treatment of the *Queen Mary*.

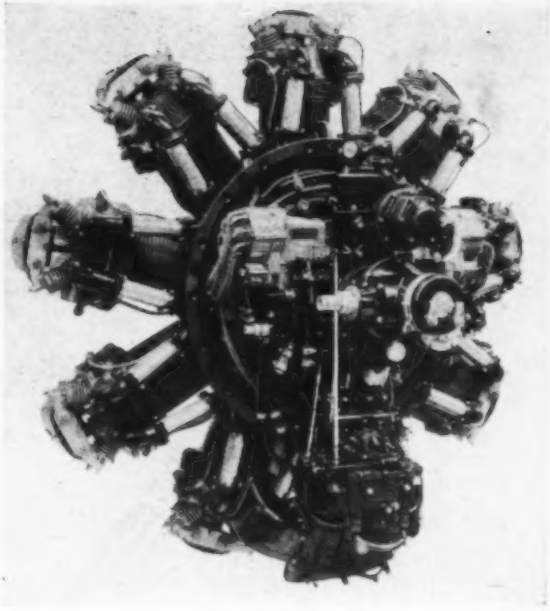
On consideration, it seems that the simplest way to go about the job will be to work from stem to stern, dealing with the upper compartments, which house the crew, in relation to the main lower deck with its passenger accommodation for twenty-four by day and sixteen by night.

As is customary, the marine gear is allocated a compartment in the bows. In the Empire Boat this is unusually capacious, extending beneath the pilot's cabin. Its equipment comprises an anchor, two drogues, a retractable mooring bollard (in the extreme bows) and a boat hook. Off-set to port is a retractable Harley light mounted on a hinged panel. Mooring operations are conducted from a hatchway in the turtle decking.

The pilots' cabin is above the rear portion of the moor-



More than thirty-six hundred horse-power is delivered for take-off to the finely pitched blades of the D.H. variable-pitch airscrews. It is provided by four of these Bristol Pegasus Xc radials.

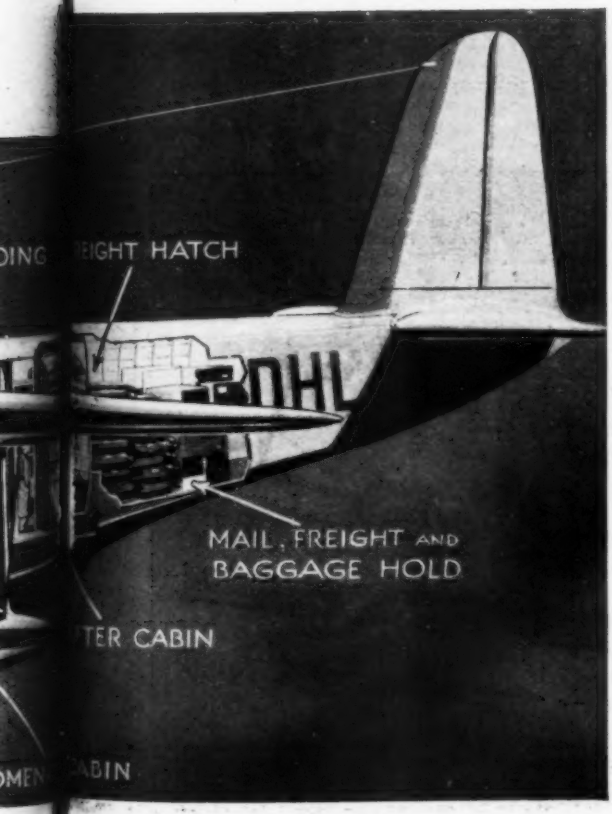


ing compartment, there being a communicating step ladder. A survey of the layout of this absorbingly interesting region is given in the two following pages, together with a description of the wireless cabin, which is located immediately behind.

Butting on to the mooring compartment is the first passenger saloon with five inwardly facing seats and another pair facing forward. This is the only compartment in the machine where smoking is permitted. A small foyer on the port side leads aft into a central corridor flanked to starboard by a kitchen, and on the opposite side by ladies' and gents' toilets. This kitchen, or as they seem to prefer to call it down at Shorts, stewards' pantry, is bound to evoke the envy of flatlet holders, being easily as large as their culinary recesses at home and better equipped, with plate racks, sink, draining-board, hot cupboard, thermos jugs and ice chest.

On the upper deck above the main portion of the smoking cabin, kitchen and lavatories, is a large compartment partitioned off longitudinally to form an office for the ship's clerk to starboard and a large hold for 3,000 lb. of mail and freight to port. The clerk's office can be entered from the starboard side of the hull and has a sliding door communicating with the hold. By the side of the clerk's desk is the main switch panel, containing fuses and switches for all circuits, ammeter and voltmeter, and controlling the

EMPIRE FLYING BOATS



instrument lights, the illumination of the cockpit and W/T cabin, wall lights in the interior, cabin ceiling lights, navigation lights and illumination for the loading hatch, mail stowage and bunk stowage. The main leads in the generator-switchboard-battery circuit are run in a completely shielded flexible metallic conduit to minimise radio interference.

On port and starboard sides respectively of the hold and office are handles controlling the opening of the annular skirt of cooling flaps on the long-chord cowlings over the four Pegasus engines out on the wings.

At the rear of the office is a step-ladder leading down to the kitchen and up to the top of the hull. On one wall of the companionway are the fuel cocks and the air intake controls which adjust the shutters for various conditions of flight.

For Promenading

The midship cabin is located behind the mail compartment, kitchen and toilets and accommodates three passengers by day and four at night. Then, farther astern comes the big promenade cabin seating eight or resting four. On the port side is a rail for elbow resting by the windows and a surprising amount of space for promenading. Leg-stretching space is always welcome on long trips. Above this cabin is a loft for bedding stowage and behind it the after cabin with six seats for daylight flying or sleeping accommodation for four. The rear wall of this cabin coincides with the after step of the planing bottom and behind it, extending well into the stern portion of the hull, is another hold for mail, freight and baggage.

Every bunk has a little window above it with a cover flap and by each row of seats are universally mounted hot and cold air intakes and a light incorporating a switch and a bell-push for calling the steward. Little hold-alls are let into the walls at appropriate points. Light luggage racks of railway carriage pattern are installed

From the outside a metallic, winged whale, the Empire flying boat has the most inviting internal accommodation as this Imperial Airways drawing bears witness. Hours can be spent exploring its interior which, in actuality, is even more intriguing than suggested here.

Even this excellent view of activity in the Short works does not do justice to the impressive scene, for it does not include the row of nine towering hulls packed side by side for plating. Incidentally, when a completed boat is moved out on to the slipway there is a clearance of about six inches between the tail and the lintel.

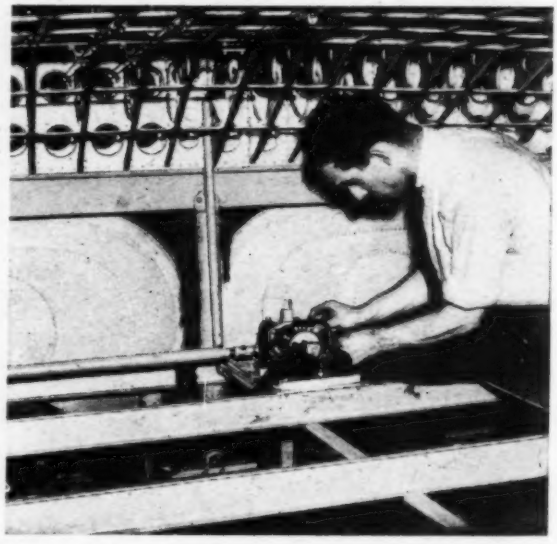
and the tables are of a special folding design, being adjustable to form book rests. The upholstery over the double sound-proofed walls and on the seats is mainly in a dark restful green and has been installed by Rumbold. The seats are of a new type, adjustable for height and tilt, with special Moseley "Float-on-Air" pneumatic cushions. The flow of air between the tubes in these cushions is restricted to counteract the effect on the passengers of aircraft movements. Rotax cabin roof lights are used, with 6- and 12-watt bulbs.

There are three Harley lamps—one, already mentioned, on the port side of the mooring compartment and one in the leading edge of each main plane. That in the bows is an 11-inch 250-watt type operated by two separate Teleflex controls, one rotary control operating the vertical movement and a similar one controlling horizontal movement. This lamp is used only for taking off and for searching when taxying. When not in use it fits flush with the side of the hull. The lamps in the wings are 500-watt models and are not controllable. They are fixed at a predetermined angle of dip and are used for landing purposes.

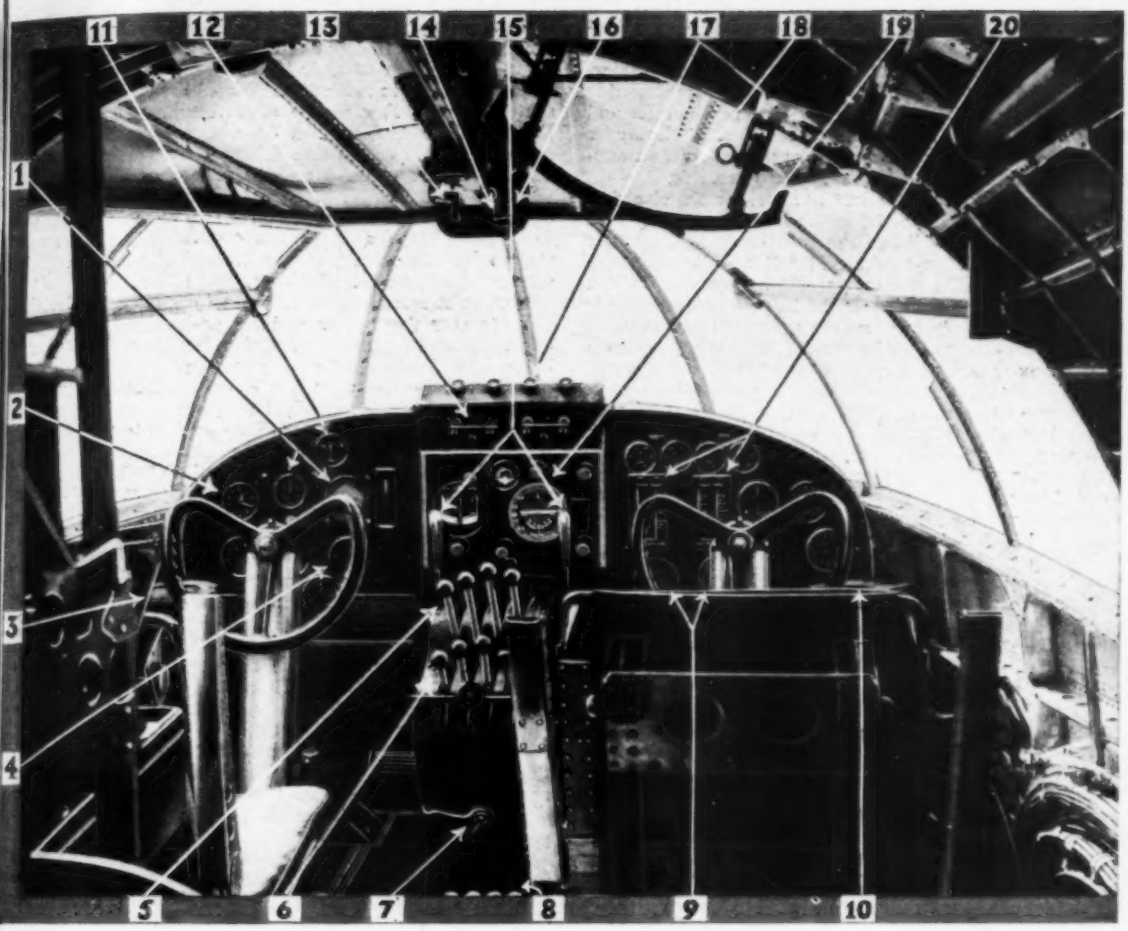
The Rotax navigation lamps are of the latest pattern, moulded in bakelite and weighing 4 oz. For wing-tip lighting a 20-watt bulb is fitted and there is a 10-watt bulb for the tail.

Each of the Empire flying boats is to be fitted with four Bristol Pegasus Xc medium supercharged nine-cylinder radial air-cooled engines mounted in staggered nacelles (which means that the outboard airscrews are not in the same plane as the inboard ones) forward of the wing. The Pegasus Xc may be regarded as the commercial version of the famous X and is normally rated at 740 b.h.p. at 3,500 ft. For take-off, 910 b.h.p. is available with the D.H. variable-pitch airscrew permitting the engine to turn at 2,475 r.p.m. The normal cruising output will be 510 b.h.p. Geared 0.5 : 1, the engine is of 28.7 litres capacity, weighs 1,010 lb., and measures 55.3 inches in diameter. It is the first unit operating on fuel of 87 octane number to go into service with a British air-line.

The engines are started by Rotax Eclipse direct-cranking starters with hand turning gear. This type of starter operates from 12 volts and turns a Pegasus at 25-30 r.p.m. The distributors of the Rotax-Watford magnetos are screened and adapted to take Marconi screened ignition harness. Booster coils are provided for easy starting, being automatically brought into circuit when the starter push button is operated. Engine temperature indicating equipment is



The great flaps of the Empire boat are operated by this little Rotax electric motor. Note also in this view the wing construction and tanks.



1. Directional gyro and artificial horizon.
2. Sensitive altimeter.
3. Port compass.
4. Rate-of-climb indicator.
5. Throttles.
6. Mixture controls.
7. Automatic pilot master control.
8. Airscrew pitch controls.
9. Boost gauges.
10. Starboard compass.
11. Homing indicator.
12. Engine switches.
13. Rudder bias.
14. Fore-and-aft trimmer.
15. Cut-out levers.
16. Flap gear.
17. Starter switches.
18. Retractable windscreen for upper hatch.
19. Automatic pilot panel.
20. Engine revolution indicators.

The Captain's Bridge : The Short Empire boat must be one of the most completely equipped machines so far seen in this country. Convenience has been studied very carefully in the disposition of the controls and instruments and this *Flight* photograph also conveys a good impression of the good view provided for the two pilots. The more important details of the installation are indicated and numbered in this photograph.

also incorporated. This is of the Rotax-Weston type, employing the Bristol thimble couple.

Like all current Pegasus models, the Xc has been developed to operate in close-fitting long-chord cowlings, and to this end has an abundance of fin area. The cowlings are provided with adjustable cooling arrangements which take the form of a ring of controllable flaps on the trailing edge. Thus it is possible to limit the flow of cooling air to necessary proportions under various flight conditions and to benefit performance. This form of cowling maintains uniform cylinder temperatures under all conditions of flight; provides an adequate control of air flow for running up and taxying under tropical conditions; and in the event of an engine failure permits increased cooling air to be supplied to the remaining engines while they are working at higher output but with the aircraft travelling at a comparatively low speed. A description of the gear was given in *Flight* of July 23 this year.

Hot air for cabin heating is taken from the exhaust systems of the inboard engines, and cold air for delivery to the cabin is scooped up from points on the leading edge of the wings.

The airscrews are of the two-position three-bladed De Havilland variable pitch type, measuring 12ft. 9in. in diameter.

Piloting and Navigational Equipment

It might be expected that Imperial Airways' very latest long-distance machine would be more completely equipped than any yet produced in this country as far as the piloting and navigational section is concerned. When sheer planning is considered, the Short Empire flying boat is probably in advance of, and certainly equal to, anything yet seen in the air transport world. Yet only well-tried features appear in the special equipment installed.

As far as is humanly possible, the "bridge" has been arranged and equipped so that each boat will be almost as independent of the outside world as a liner. The installation will enable the machines to fly, when necessary, as self-contained units, and this installation has been designed so that no possible emergency will leave the boat without the very necessary contact with civilisation.

From this point of view, therefore, the special Marconi radio equipment can reasonably be considered as the most important. In the layout of the Empire boats the radio operator's compartment, with chair and desk, lies imme-

diately behind the control cabin, and the whole area, raised as it is, and reached by ladder from the lower deck, can only be alluded to as a "bridge." In front of the operator, who has his back to the pilots, are the normal transmitting and receiving sets for wavelengths of 600-2,000 metres and from 16-75 metres. Beside him on the floor of the upper deck, in series, is the auxiliary power supply unit, an electric motor and a special double-output generator.

In the ordinary way a 24-volt battery, for the electrical supply of the whole ship, feeds the motor, which in turn drives the generator. When the machine is on the water a small fan-cooled two-stroke motor is used to drive the generator through the free motor, which, incidentally, can be used to start the engine. If the battery is very low the engine is started by handle and the motor becomes an L.T. dynamo for charging the battery. The engine lies in a gasproof box as far as the interior of the boat is concerned. Normal electrical supply is obtained from Rotax D.C. generators on two of the Bristol engines.

Special shockproof supports have been developed for the mounting of the radio sets, with which is incorporated the direction-finding receiver. The loop for this is so mounted that it can be retracted into the hull when not in use, and this can also be fixed athwartships and used for "homing," either aural or visual on-course indications being given to the pilot. In normal flight the fairlead for the trailing aerial extends some two feet through the bottom of the hull in the marine equipment "forecastle." When the aerial has been wound in before arrival and the equipment has been switched over to the fixed aerial, this fairlead is drawn up through a spring trapdoor and this is sealed by means of a rubber joint.

The Control Cabin

Needless to say, the completeness of navigational equipment is, to the observer's eye, even more marked in the control compartment. Yet, though there are probably more instruments in the Empire boat than in any other civil machine in this country, there is none of the appearance of overcrowding or painful complication that is apparent in, for instance, some American transport types. The fact is, of course, that there is plenty of room both in the compartment and on the dashboard itself. Every essential control is both easily reached and easily operated, and every essential instrument is easily picked out.

All the major controls are centrally placed, so that they can be operated from either seat without trouble. At the top of this central control bank there are the starter buttons and engine switches, and it is typical of the thought expended on the whole layout that the safety cover for the starter buttons should be engraved with the queries: "Are all boats clear?" and "Are all hatches closed?" Below is the Sperry automatic pilot panel—an unusual but encouraging sight on an English machine.

Extending away from the dash and downwards are the throttle and mixture lever gates, with a master control for the latter. On either side of this gate are two levers which must be fairly new to pilots. These are cut-out levers, and their purpose is to make the engines absolutely dead after switching off. Particularly after the amount of taxying that will be necessary in a boat of this kind, air-cooled engines will tend to continue firing intermittently, and these controls, which actually cut the fuel off at the jets, will obviate this difficulty. At the base of this bank are the Sperry master control lever and the four airscrew pitch controls, these being pressed down to obtain fine pitch and vice versa. Level with the backs of the instantly adjustable seats are the various master fuel cocks.

Above the screen centre is a panel carrying the electrically operated flap switch and the position indicator. No effort whatever is demanded of the pilot when the flaps are being raised or lowered at a steady rate, and the Rotax motor used for the operation is switched into circuit by means of a solenoid. Special switches break the circuit when the flaps have reached the end of their travel. Behind this panel are the fore and aft trim and rudder bias controls, with an indicator for the former. These controls are small handles, and the spindles lie in different and obvious axes, so that there could be no possibility of making an emergency adjustment of the trim with the bias control.

Instrumental

So much for the major controls. The panel in front of each pilot carries, in *Centaurus* at any rate, duplicated versions of the essential flying instruments, including a Hughes turn indicator. That before the captain, however, also carries Sperry artificial horizon and directional gyro, a Kollsman sensitive altimeter, a liquid pitch indicator, a Hughes rate-of-climb indicator, the Marconi "homing" indicator, and a special Smiths chronometer for navigational purposes. The first officer's panel also carries the normal revolution counters, boost gauges, and oil pressure gauges. In addition there are two Hughes P/4/11 compasses, one for each pilot.

At the captain's left side are panels carrying switches for the various instrument lights and landing lights, while the main electrical control panel is at the rear of the upper deck. In addition there are the Sperry servo-speed control valves for varying the effect of the automatic pilot in the three separate axes. Behind the first officer's seat is a large instrument board carrying those engine and vacuum pump gauges and so on which do not necessarily need constant attention. Above, in the roof, there is a hatch with a retractable windscreen for use when celestial observations are being made.

Needless to say, the essential range of vision from the pilot's compartment is extremely good, and this range is considerably helped by the facts that the compartment is so well ahead of the engines and that the machine is, in any case, a high-wing monoplane.

PROPRIETARY EQUIPMENT

Some Idea of the Multiplicity of Equipment in the Empire Boats is Obtainable from this List of the Firms who are among the Chief Contributors of Large and Small Items

ARENS CONTROLS, LTD.—Arens controls.
BELL'S ASBESTOS, LTD.—Asbestos covering.
D. H. BONNELLA, LTD.—Electrical parts, terminal blocks, etc.
BOWDEN (ENGINEERS), LTD.—Bowden control cables, etc.
BRISTOL AEROPLANE CO., LTD.—Engines, exhaust rings, air intakes, cowls, etc.
BRITISH ALUMINIUM CO., LTD.—Aluminium sheets, tubes, ingot and bar.
BRITISH INSULATED CABLES, LTD.—Electric cable.
BROWN BROS., LTD.—A.G.S. parts, special stainless and duralumin bolts and nuts.
BURLEY, LTD.—Rubber bushes, blocks, hose, etc.
CALLENDERS CABLES AND CONSTRUCTION CO., LTD.—Electric cable.
CORK MFG. CO., LTD.—Langite and cork floats.
CORNERCROFT, LTD.—Aluminium and Alclad spinnings.
DE BERGUE'S PATENTS, LTD.—Patent duralumin rivets.
DE HAVILLAND AIRCRAFT CO., LTD.—Controllable-pitch airscrews.
DUNLOP RUBBER CO., LTD.—Rubber tyres and wheels for beaching gear.
EDISON SWAN ELECTRICAL CO., LTD.—Electric bulbs.
EXACTOR CONTROL CO., LTD.—Hydraulic controls.
FIRTH-VICKERS STAINLESS STEELS.—Stainless steel. bars and sheet.
FLEXO PLYWOOD CO. (INDUSTRIES), LTD.—Aero birch plywood.
GUEST, KEEN AND NETTLEFOLDS, LTD.—Light alloy screws.
H. M. HOBSON (AIRCRAFT AND MOTOR) COMPONENTS, LTD.—Carburetters and automatic boost controls.
J. J. HABERSHON AND SONS, LTD.—Carbon steel strip, stainless steel sheets and strips.
HENLEY'S TELEGRAPH WORKS, LTD.—Electric cables.
HIGH DUTY ALLOYS, LTD.—Hiduminium alloy sheets.
HOFFMANN MFG. CO., LTD.—Bearings.
MANGANESE BRONZE AND BRASS CO., LTD.—Oilite bushes.
MARCONI'S WIRELESS TELEGRAPH CO., LTD.—Wireless equipment.
MAY AND BAKER, LTD.—Rhodoid sheeting.
MOLLART ENGINEERING CO., LTD.—Universal ball joints.
D. MOSELEY AND SONS, LTD.—Rubber sheet.
NORTHERN ALUMINIUM CO., LTD.—Aluminium alloy sheets, D.T.D. 111 and D.T.D. 275, and aluminium alloy bar.
POWER FLEXIBLE TUBING CO., LTD.—Avioflexus tube and connections.
REYNOLDS TUBE CO., LTD.—Hiduminium RR. 56, extrusions, tubes, bars, etc., and steel tubes.
ROTHERHAM AND SONS, LTD.—A.G.S. parts, bolts, nuts, screws, etc.
ROTAX, LTD.—Electrical equipment.
RUBERY OWEN AND CO., LTD.—Detail fittings.
L. A. RUMBOLD AND CO., LTD.—Cabin decorations and upholstery.
G. SALTER AND CO., LTD.—Springs.
SIMMONDS AEROCESSORIES, LTD.—Simmonds nuts.
SMITH'S AIRCRAFT INSTRUMENTS, LTD.—Instruments—all types.
SPERRY GYROSCOPE CO., LTD.—Lord shock absorbers Sperry horizons, automatic pilots, etc.
STERLING METALS, LTD.—Manganese castings.
TECALEMIT, LTD.—Greasers.
TECHNICAL PLATINGS, LTD.—Anodising.
WEBLEY AND SCOTT, LTD.—Signal pistols.

THE FOUR WINDS

ITEMS OF INTEREST FROM ALL QUARTERS

K.L.M. are considering entering a Douglas D.C.3 for the New York-Paris race next May.

Mrs. Mollison has announced that she will fly solo in the same event, but has not yet decided on a machine.

The first production type Fairey Hendon heavy bomber has been delivered to the R.A.F. from the Fairey Company's new works at Stockport.

It is hoped that the Lord Mayor's Show on November 9 will include a demonstration by a detachment of the R.A.F. of how the Service has developed since the time of its formation.

General Goering opened, last week, the new headquarters of the Sixth Air Division at Kiel. It will control the air defence of the North and Baltic Sea coasts.

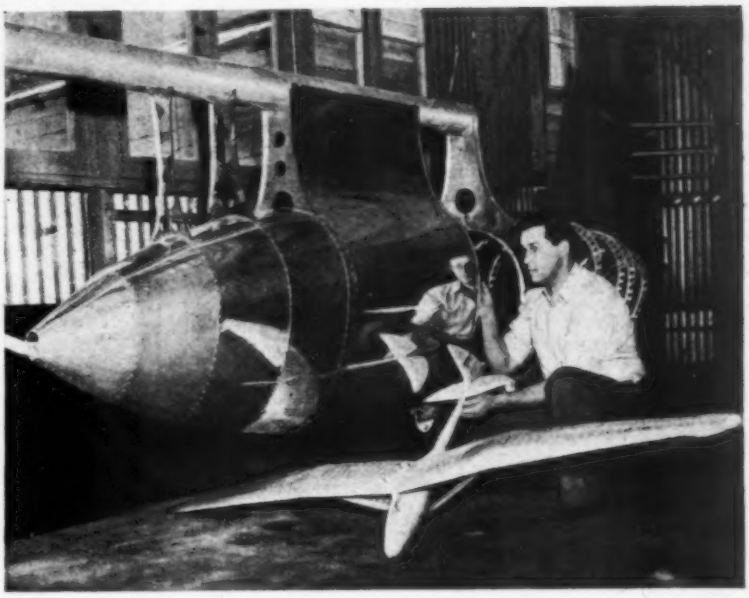
Twenty-five Years Ago

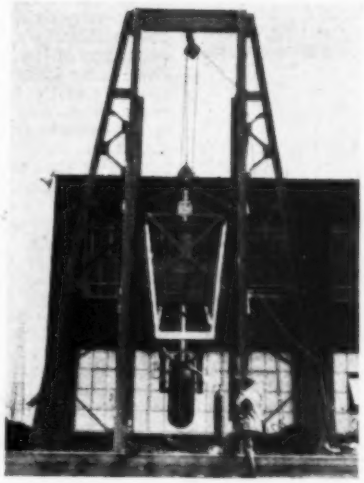
(From "Flight" of October 28, 1911.)

"The latest 'stunt' . . . is the delivery of boots from Northampton to London by aeroplane. Moorhouse, who undertook to carry out the service, made his first delivery on Thursday of last week, when, despite a thick fog and a high wind, he flew to Hendon with a load of twelve pairs."

As a result of the devaluation of the franc, Imperial Airways announce that fares have been reduced on their London-Paris route. The single fare is now £4 10s. instead of £4 15s., and the fifteen-day return £7 10s. instead of £7 15s.

The Westland army co-operation monoplane to specification A.39/34 is to be fitted with a Bristol Perseus PRE.3M sleeve-valve radial of 800 h.p. in place of the present Mercury. It will drive a "5,000" size D.H. variable-pitch airscrew—the largest manufactured.





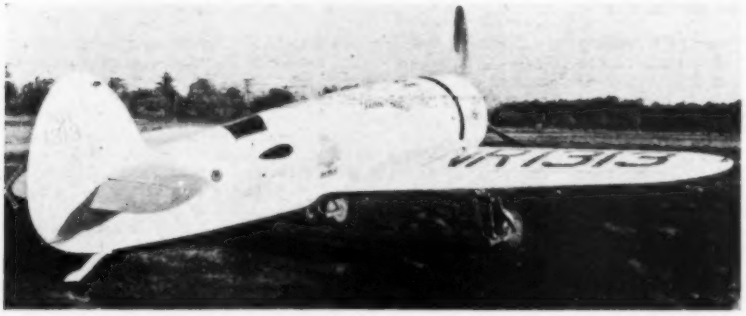
EIGHTY-TON SHOCK: On the right is a test jig used by the Boeing company for testing the main wheel assembly of their 299 bombers. Tests have shown that the gear will withstand a load of about 80 tons although the gross weight of the machine is only 16 tons.

SUPER SAILPLANE: Hawley Bowlus, who taught the Lindberghs to glide, is building an all-metal sailplane weighing 350 lb. which he has designed to soar, non-stop, from San Francisco to Los Angeles. He hopes it will cover the 450 miles in about ten hours. The span will be over 62 feet and landing flares and navigation lights will be fitted. Mr. Bowlus himself will act as navigator while another man flies the machine.

Known as the Harrow, a heavy bomber development of the H.P.51 bomber transport, with two Bristol Pegasus engines, is now flying. In general appearance it resembles its predecessor and incorporates leading edge slots and slotted trailing edge flaps.

The D.H. Comet used in the MacRobertson Race by the Mollisons and subsequently purchased by the Portuguese Government is up for sale at Hatfield.

In the B.B.C. Childrens' Hour series *How and Why* a programme entitled *How an Aeroplane Flies* will be broadcast on November 11 in the Midland programme. The B.B.C. mobile unit has visited Castle Bromwich aerodrome to take recordings.



RETRACTABLE VISION: The American caption to the picture on the left reads "Smooth as a raindrop from nose to tail, Captain Frank Hawks' new mystery ship, *Time Flies*, will knock speed records silly when he puts it in flight later this month." The machine has a Pratt and Whitney Twin Wasp engine and retractable cockpit enclosure and undercarriage.

NOT SO ECONOMICAL

Point and Counterpoint After a Paper on the Economics of Air Line Operation Read by Mr. L. T. H. Greig Before the R.Ae.S.

ONCE again it must be admitted that hardly anyone in the business of air transport knows what he wants or what to do about its future, and that hardly two people in this business have the same ideas.

There was nothing particularly new or startling in the lecture on "The Economics of Air Transport," read last Thursday before the Royal Aeronautical Society by Mr. L. T. H. Greig, of Jersey Airways, and certainly there were no economics. Sir Francis Shelmerdine had already stressed the majority of its points in a previous lecture covering much the same subject matter. However, if Mr. Greig's lecture had no other effect, it certainly helped the audience to realise that even the most successful operators are hardly nibbling at the possibilities, and it also encouraged various listeners to air their widely divergent views. Mr. Greig, of course, dealt only with comparatively short internal air lines and, naturally enough, based his remarks on experience gained with Jersey Airways.

Upon the choice of route, said Mr. Greig, would depend the type of aircraft to be used, its size, speed, carrying capacity in relation to cabin accommodation, the type of passenger to be catered for, and hence, the form of ground transport, if any, to be provided. Even the office organisation would be largely affected, and, in short, upon this one factor the whole complexion of the company's operating policy would depend. In general there were four main types of internal air line in this country: (1) the very short ferry service; (2) the lines serving substantial centres of population with stops not more than 200 miles apart; (3) the lines principally serving centres of population 300 to 400 miles apart; and (4) the lines crossing substantial distances of sea.

Tangible Advantages

In each case the first question to be asked was whether the proposed air line would give the travelling public a tangible advantage over their alternative means of transport. Considering this point, the *total* transit time was that which mattered. Members of the public were largely creatures of habit in so far as transport is concerned, and it was very difficult to change these habits successfully. If the change was restricted to mode of transport between thoroughly familiar destinations, the problem of inducing large numbers of the public to take to the air became greatly simplified. The smaller the advantage that air transport had to offer on a particular route, the greater the need for studying the habits of the travelling public, and the greater the risk that would be entailed if those habits were seriously interfered with. Thus, on the very short ferry service, not only was much time unavoidably wasted in ground transport to and from the aerodrome at each end, but the competitive means of transport took such a relatively short time that some very considerable inducement had to be offered. All the overhead charges had to be borne by the revenue obtained during relatively few months in the year, while the flying time would fall alarmingly in proportion to the waiting time.

Mr. Greig then went on to explain the question of travelling times over a comparatively short route, and said that, as the smaller type of machine could not compete in the matter of comfort with first-class rail travel, some other inducement would have to be sought. The only possible inducements were flexibility and frequency.

Cross-country services might pay, but if there was no good rail service between two centres then it was improbable that the demand existed. The third case was more hopeful. At the present stage it was not possible to operate over any route with train-like regularity, and, when frequency was considered, it was often found that people preferred to travel at certain distinct times of the day.

In these types of operation the dominating factor had been the very competitive services offered by other means of transport. The true economic needs of aircraft as a primary means of transport had been largely obscured. The fourth type, over sea, left the operator in the fortunate position of being able to offer substantial inducements to the public. Mr. Greig gave his reasons for preferring the landplane for such work; but suggested that machines might be designed which could alight safely on water and could remain afloat for long periods. The problem was resolved into the simple one of deciding what type of landplane to use. Speed could be a very expensive luxury indeed. In his own company's operation between Heston and the Channel Islands, the distance was 185 miles, and at a cruising speed of 130 m.p.h., this journey took, all-in, approximately 1½ hours. An increase in cruising speed to 200 m.p.h. would reduce the journey time to approximately one hour. The time taken to unload and re-load the aircraft would, however, remain the same, and, in practice, only one extra return journey a day would be possible with the faster aircraft. In practice this meant that an extra service could be operated at a time of day when the general public were not anxious to travel, and the only effect would be to perform the same number of journeys in less flying time. The effect of this would be to spread overhead costs over a smaller number of flying hours. The lecturer then expanded this statement with a somewhat unconvincing argument in which a machine was visualised as covering the journey almost instantaneously. Presumably the passengers would still be expected to pay the same fares! He would be little worse off, and the machine could be used again for other services. The flying hour-cost argument only holds between certain limits. There was, he said, an optimum speed for each particular service, and any departure from this optimum speed would give rise to inefficiency.

Size of Machine

The next question was whether to use small numbers of very large aircraft, or larger numbers of smaller aircraft. In the case of his own company, the "peak" loads encountered were as much as fifteen times the minimum load offering. The governing factors must be: (1) the minimum average load offering; (2) the minimum size of aircraft capable of giving the requisite standard of comfort and efficiency. If the traffic on a given route rarely fell below 25 in each direction per service, and if the low average figure was of the order of 30, then it was plainly more economical to use a number of aircraft seating 35 than to use a substantially larger number of aircraft seating 15.

The wider the fluctuation of the traffic the more desirable did it become to have a fleet of aircraft all of about the same type, size and speed, and to treat them all for traffic purposes

as carriages in a train. Mr. Greig then spoke of staff efficiency and compared the luxury type of service with that designed purely for utility.

He thought, turning to the question of freight and mail transport, that operators in this country, for the most part, lacked the necessary experience to operate a regular night service with the requisite degree of regularity and safety. In addition, few, if any, of the aerodromes that would be required to be used had the necessary ground equipment to make a regular night service really safe. However, provided that the technical considerations involved could be satisfactorily dealt with, a night service for freight and mail offered very great advantages from an economic standpoint. It would be a rather dangerous gamble for an internal air line operator to purchase special equipment for the sole purpose of flying mails and freight. If, however, an operator was able to utilise, during part of the night, aircraft which carried passenger traffic during the day, the situation became considerably simpler.

Speaking of the staff problems, Mr. Greig said that the pilotage, engineering and traffic staffs of any air line were, it appeared, forever carrying on some form of private warfare. The most that could be hoped for was to keep such misunderstandings upon a friendly basis. Any sort of favouritism or appointment of individuals because they were friends or relatives of some influential person had devastating effects upon the morale of the company. Age or previous experience had little bearing upon the question, and, so far as traffic was concerned, he had found that the more experience an applicant, for the most part, had had of passenger traffic generally, the less likely he was to reach the quite high standard of efficiency required by Mr. Greig.

The lecturer concluded his paper with a brief appreciation of the work of Imperial Airways.

The Discussion

Mr. H. E. Wimperis, the new president of the Society, reminded his audience that the lecturer had been with Jersey Airways since its inception and then called upon Major Mealing to open the discussion. The latter, aptly enough, reminded everyone that there were no economics in the paper, asked what airline operation actually cost and whether the internal operators were providing what was wanted. He suggested morning and evening services to compete with the sleeper train and supported Mr. Greig in his demand for a machine which was 75 per cent. landplane and 25 per cent. seaplane.

Thereafter, the discussion tended at times to be something of a night out for General Aircraft. Mr. Hollis Williams suggested that passengers might be collected at their homes, and, in fact, that passengers should be given every attention. Mr. Farey Jones (of B.C.A.) later took a diametrically opposite stand and asked why passengers should even be taken to the airport. Airline operation was, in fact, a job by itself, and he saw no reason why an aerodrome should not be treated as a railway station and thought that transport co-ordination was essential. He looked forward to the day when transport machines would fly round the clock on their various services and suggested a coastal service. He claimed that the modern "cheap" transport aeroplane cost half its own price in maintenance. He demanded more facilities from the Ministry and finally suggested that operators might really try to give the public what it wanted.

In the meantime, Capt. Dismore relieved the situation by recalling the days when a pilot at Hounslow would try to convince a prospective passenger for Paris that Brussels was a more pleasant destination, and when we spoke of lb.-miles rather than ton-miles. Mr. Noel-Brown said that operators did not know what they wanted and referred to *Flight's* series of articles by various operators. He said that for long-distance work it was permissible to think in terms of 100 h.p. per passenger, but that for ferry work the figure of 20-25 h.p. could be considered. "Every hour on the hour" was his slogan, and he put up an excellent case for the use of a multitude of smaller machines during preliminary operations.

Group Captain Primrose complained of the inequalities of the present booking arrangements and of the public's needs in this direction. He also sensibly remarked that the night flying question formed a vicious circle, inasmuch as until operators show some enthusiasm the Ministry is not likely to expend large sums of money, while until these sums are spent the operators will not try to run night services. To carry night mails was one good way of keeping a machine in the air round the clock.

Mr. Gordon England's remarks, though naturally not agreed with by everyone, certainly carried some very good points. Operators were, he said, going about the whole business in the wrong way. They appeared to think that the public ought to patronise air services, and they tended to *demand* support rather than to earn it. Unless these operators provided useful services they could hardly expect air travel to become a habit. At present the public were expected to put up with inefficiencies on the principle that air travel "was awfully jolly when you get going," and he insisted that booking should be made much more easy. No one should be expected to travel by air until the facilities provided were perfect, and the Ministry should see to it that the ground organisation was standardised.

Learning from Experience

That we had failed even to realise that it was possible to learn from previous transport experience was Major Kennedy's primary contention. Security of tenure in the matter of support and basic finance was absolutely essential. Parliament, in fact, had to do something about it. Another speaker claimed that the vital advantage of air travel was that the passenger *did* receive personal attention all the way, while two others asked for definite information about the costs and about the question of comfort or speed.

Befort asking Mr. Greig to reply, Mr. Wimperis spoke of the need for co-operation between the transport services, and mentioned an interesting point about the effect of higher speeds on cabin silence. He had not, perhaps, travelled in the Douglas, which, though fast enough, is as silent as *Heracles*.

For the most part, Mr. Greig's replies were repetitions of statements which he had previously made, since the discussion was not so much a discussion as a series of separate talks, and the questions asked were mainly rhetorical. However, he did have a chance of expanding his previous claims that no one wanted to travel by night, that any cost figures from his own experience would be misleading, that the passenger doesn't want to fly but must be cajoled into the cabin of a transport aeroplane, and that passengers were used to certain centres of departure and to certain definite times of travel.

In fact, airline passengers were alluded to as half-wits throughout his lecture and subsequent remarks; presumably operators and R.Ae.S. audiences were not included in this generic condemnation because they do not travel by air. Mr. Greig went on to complain of the inaccessibility of, and omitted refinements in, the present-day transport aeroplane, and explained the necessity for complicating booking systems on the score of loaded weight. He disapproved of subsidies largely because one could never depend on their continuation. As for night flying, he very rightly claimed that bad weather was a very serious matter at night, and said that no night flying had been carried out in Europe—at any rate, with real reliability. He unfortunately overlooked the night mail service run, winter and summer, by D.L.H. between Berlin and Croydon. Though the facilities at the latter airport have been fairly primitive this service has operated for a very large number of years with a regularity equal to, or better than, that of any daylight service in this country.

The Shadow Engine Industry

THE Air Ministry now officially announces that arrangements have been completed for the erection of six government-owned factories for the production of additional aero engines for the Royal Air Force, and the erection of the factories is in progress.

The firms which have undertaken the erection and management of the factories are the Austin Motor Co., Ltd., the Bristol Aeroplane Co., Ltd., the Daimler Co., Ltd., Rootes Securities, Ltd., the Rover Co., Ltd., and the Standard Motor Co., Ltd.

Through a Glass—Brightly

AIRCRAFT constructors should find a number of uses for a new inspection magnifying glass known as the Ultra Lens. A pocket-size instrument, it gives a magnification of fifteen, and brilliantly illuminates the work by means of an internal battery and lamp.

Sold in a case with a spare bulb and battery, a transparent measuring scale of ½in. square, a ½in. straight scale graduated in hundredths of an inch, and a 1 cm. scale graduated in quarter millimetres, the Ultra Lens costs £2 2s. The maker is Richard Bock, Finsbury Court, London, E.C.2.

Private Flying

Topics of the Day

Blind Alleys

IT often appears to me that just as soon as the constructors of light aeroplanes find themselves, so to speak, out in the open they immediately find a blind alley and run up it as fast as they can go, forgetting that there is an end to it.

When we were very young there appeared the answer to the enthusiast's prayer—the D.H. Moth. Laughing aside the unique but somewhat useless performances of the motor-gliders, Capt. De Havilland produced a sturdy type with a comparatively large slow-running engine. There followed the silence of satisfaction at Stag Lane, Castle Bromwich, Woodford and Cramlington, while the waiting few were bundled into somewhat cramped cockpits and taught to fly.

Presently the private owner appeared and almost immediately demanded more speed, more carrying capacity and a better take-off. The power went up, the weight went up, and the costs went up. A little later there appeared the cabin three-seater, exemplified by the Puss Moth and the Desoutter. We were cruising at 110 m.p.h. or more, and matters remained quiescent for a while. The light aeroplane settled down in not-so-light form with a very useful cruising speed and some considerable comfort for the occupants. The cabin trainer eventually appeared —and was disapproved of by the majority of instructors, rightly or wrongly and for the time being.

The Speed Question

SUDDENLY, a year or more ago, everybody started to clamour for cheaper flying. Various people got down to the job and either designed what they thought might be wanted, or imported a suitable design. It remains to be seen whether these machines will be bought in any useful quantity.

Already, however, like straws in the wind, one can overhear complaints from the right and the left. Mr. A. had to put down at X aerodrome on his way to Y because the machine was bucking a 35-m.p.h. head wind and just couldn't get through. Mr. B. had force-landed at Puddleton on his way to Z aerodrome and his machine had to be dismantled because he was unable, through the long grass, to reach flying speed early enough for safety. Immediately one hears wails from all sides. What is the good of a 65-m.p.h. cruising speed; what is the good of an aeroplane so low-powered that it cannot be made to accelerate in unfavourable conditions? And so on.

To these children I can only say: What is the good of clamouring for something that you don't want when it has been produced for you? It is *possible* to produce a small-powered machine with a high performance, but the necessary cleanliness costs money and makes the machine a little less suitable for the novice. At the present stage an easy-to-fly ultra-light aeroplane must be comparatively slow and, since you cannot have something for nothing, the climb in time may be poor, though in distance it may be quite as good as that of more powerful machines.

If you want easy flying for a small capital outlay and very small running costs, then you must put up with the inevitable disadvantages.

At present, of course, practically all the pilots who fly the ultra-lights have learnt on something bigger and faster and are necessarily disappointed. In a year's time there will probably be quite a number of pilots who have been taught in the seats of 30 h.p. machines; they will know no better and will think that these machines are admirable in every way. So they are—as far as they go. We others have been spoilt. I always try to remember, when flying one of them, what I felt about the take-off and speed of the Cirrus I Moth on which I made my first solo flight.

Fussing the Novice

WHENEVER I have been passed out on a new and more complicated type I have complained bitterly to myself about the way in which I am forced to do close circuits and, consequently, am given no time to do much more than open throttles, wind tail-trimming wheels, watch r.p.m.s and A.S.I.s, pump down flaps and apply brakes.

The result is that I become superheated with anxiety and my flying (as flying) is by no means as perfect as it might be. Usually, too, my hands tremble when I light the post-aviational cigarette—unless I have had the chance of composing myself with a few loose circuits all alone. Even the best and most patient of instructors give me a "can't-do-worse complex."

That being so, what of the absolute novice? A correspondent in this week's issue suggests that this persistent circuit flying business is all wrong. I'm not sure that it isn't—at least for any pupil who is not composed of cheese. We have all thought, and some of us have said, "I know I can do it properly if only you will give me time, time, time." No sooner has one perilously climbed off the ground than one is reminded (quite kindly, of course) of the setting of the trimmer, of the excessive speed of engine and airframe, of the flatness of the turns. We are paralysed with bothers to such an extent that we either completely forget to hold off at all, or we do it in a series of jerky movements caused entirely by nervous embarrasment. This embarrasment is almost complete when the stick is wrenched out of one's hands, is waved furiously, yet more furiously, and quite incomprehensibly. It is *quite* complete when the gentle voice says that we shall go in now and try to do better next time.

Somebody ought to try the experiment of letting a pupil fly about for ten minutes or more between each landing until these are so nearly perfect that half a dozen quick ones will complete the job. By that time the pupil won't mind the quickness and will enjoy the grass-clipping climbing turns of an instructor's tight circuit. The result might be enlightening by comparison.

INDICATOR.

FROM the CLUBS

Events and Activity at the Clubs and Schools

BRISTOL

FLYING time for the week ending October 27 was 23 hr. 15 min. and for the following week 10 hr. 25 min. New members are Messrs. W. A. Lacy Tuck, N. A. Clark and D. H. M. Horner. There will be a car treasure hunt on November 7.

YORKSHIRE

Although storms rendered flying impossible on three days of last week, Club machines flew 11½ hours. Mr. F. Jowett has become a pupil under the Air League Young Pilots' Fund Scheme.

PORTSMOUTH

Club machines flew 16 hours last week, and Messrs. M. Lamplough and A. J. Stedman became members. Mr. Lamplough, together with Messrs. R. O. M. Graham and J. F. Carroll, intends to qualify for the pilot's "B" licence.

BORDER

The weather has affected club flying on several occasions, but, regardless of this, two fine cross-country flights have been made by Mr. Beauchamp and Mr. Lightfoot. There is a decided slackening off in the number of visiting machines, although they arrive with fair regularity.

YORKSHIRE AVIATION

The total flying time at York aerodromes for the month to the 24th is 92 hr. 5 min. Messrs. Noyse and King have become pupils and Messrs. Stubbs, Wheatley and Hurtley are members. H.R.H. The Duke of Kent landed at York aerodrome, whence he drove to open the new Scarborough Hospital.

BENGAL

With the arrival of the new pilot instructor, Flt. Lt. W. F. Lovering, on September 12, normal flying activities were resumed, but the abnormally stormy monsoon was a handicap. The flying times for September were 14 hr. 5 min. dual and 18 hr. 45 min. solo. Mr. Srinibash Banerjee is taking instruction.

READING

Miss Holmes and Mr. Clarke have become pupils, and Mr. Kidley has taken his "A" licence. Mr. Karl Sandberg, who is staying at the Club, has bought a Falcon, which he is flying back to Sweden. Visitors to the Club last Sunday included Mrs. Beryl Markham, Miss Florence Desmond and Mr. Percival. The total of last week's flying times was 54 hours.

SOUTH COAST

The Miles Whitney Straight was demonstrated and flown by several members last week-end. Miss Kelsey and Mr. E. M. Edlin have gone solo. Arrangements have been made for ground instruction, including the full "B" licence course, to be given at Shoreham by Mr. Cracknell. The annual dinner dance will be held at the Grand Hotel, Brighton, on Friday, November 20, at 7.30 for 8 p.m. Last week's flying time was 30 hours.

CINQUE PORTS

Fifty-three hours' flying was recorded last week in addition to 3½ hours' night flying. Messrs. Baillie and Hilditch have completed their "B" licence night flights; Mr. McCartney has returned for the "B" licence night flight; while Mr. Hymans has completed his instructor's course. Miss Jeanne de Casalis has been passed out to fly the Leopard. Messrs. Dickson, Campbell and Galloway have returned after a prolonged absence, the latter to complete his "A" licence and Mr. Campbell after three months in South Africa.

WITNEY AND OXFORD

There has been little flying owing to weather and engine overhauls. Mr. K. E. Walter, the Club instructor, is on a Reserve "ground course" and a short holiday. Mr. V. A. Dawson is taking his place temporarily. Messrs. John Dugdale and F. W. Hamlet have become members. Mr. H. F. R. Sewell, a Club member for the pilot's "B" licence, has obtained his ground engineer's "A" and "C" licences. Mr. H. A. Beyers and Mr. H. F. R. Sewell are taking the W/T course and Mr. A. O. Cundy is about to essay tests for the pilot's "B" licence.

BROOKLANDS

The Great Fire is recorded on page 440. A total of 95 hours dual and solo flying was logged last week. New members include Miss d'Anacker, Mr. R. A. C. Evans, Mr. H. W. Gush, Mr. R. Schmidt and Major J. Shearer. Miss Friedlander and Messrs. Harper and Mackenzie have made successful first solos, and Mr. Tha has completed his height test. Last Sunday week eleven machines went on a "lunch patrol" to Shoreham and Mr. J. S. Machin won a champagne lunch. On the same day the Miles Peregrine visited Brooklands and caused a lot of interest. The reconditioned surface of the aerodrome is now in use. There will be a dinner dance and firework display on Saturday, November 7.

REDHILL

The Puss Moth is back from the Continent, but the Fox is continuing its Continental tour. Club machines flew 42 hours during the week ending October 23.

HANWORTH

Mr. Howell Jones (National League of Airmen) has become a member; Mr. C. F. Bennett and Mr. J. Bull have passed their "A" licence tests; and Mr. P. O'Reilley has gone solo. Preparations are being made for a bonfire and dinner and dance on the "5th."

YAPTON

The flying times for October to the 24th totalled 75 hours, although the weather during that period was none too favourable. Mr. C. Dadswell is taking the £15 "A" licence course and Mr. J. Lauderdale has gone solo. Messrs. K. Vishvanath and John Hunter have made their night flights for the "B" licence. Mr. R. Alington, a brother of the Club instructor, Mr. W. J. Alington, is taking an "A" licence course.

HERTS AND ESSEX

For the week ending October 16 flying times totalled 91 hr. 6 min., although the weather was unfit for flying on the 19th. Rather less flying was logged last week, the figure being 74 hr. 31 min. First solos were made by Messrs. S. R. Pemberton, D.R.G. McGregor and S. G. Powell. Mr. L. Larsen completed the night flight and Messrs. S. G. Smith and H. J. Romer have taken their "B" licences. The latter is compiling further hours for his instructor's endorsement. A Club machine was used in co-operation with the Haileybury College O.T.C. field day manœuvres. New members are Messrs. R. P. R. Carpenter, M. H. Paranjpye, F. H. Pryke and H. Jensen. The Club's annual dinner and dance will be held at the Park Lane Hotel on December 3.

HESTON

Every year Airwork trains between sixty and seventy new pilots, of whom perhaps 25 per cent. may be women. Nearly half, however, of the school's total flying time is solo put in by newly qualified pupils, or by a few "regulars" of many years' standing. The available fleet consists at present of six aeroplanes—five Cadets and a Moth. An additional Moth is reserved for the use of members of the Old Etonian Flying Club. Only two instructors are engaged on regular school work.

This leaves at least three aeroplanes free for solo, or for navigation with the third instructor, who specialises in that subject. These aeroplanes may be hired for solo by flying members at a cost of £2 2s. an hour, including fuel, or £4 4s. a day, excluding fuel (a "day's" hire extending until 10 o'clock on the following morning). They are fully insured, no excess payment being required of the hirer in case of damage.

The names of the late-summer batch of new-fledged pilots are given below. They include Mr. David Cunynghame, production manager of London Film Productions (he has been with that company since it started); Mr. Hector Hamilton, the architect; a cavalryman, several officers and ex-officers of the Brigade of Guards, several business men, a Dutchman, a Brazilian and a naturalised Czechoslovakian. Since August 1 the following people have obtained "A" licences: G. A. Vandervell, A. Sanchez-Arbide, the Hon. A. J. Verney-Cave, W. Von [illegible], Capt. J. B. Norton, H. B. Wilkinson, H. D. Cunynghame, E. W. Pasold, W. R. Trounson, D. D. Walker, G. N. Stead, [illegible] Waring, Mrs. D. D. Sainsbury, H. H. E. M. Winch, R. M. Dennis, A. D. Hamilton. Mrs. William Rhodes-Moorhouse, wife of the first air V.C. of the war (awarded posthumously) is taking a "refresher" course. She and her son, Mr. W. H. Rhodes-Moorhouse, who learned to fly while still at Eton, are pilots and private aeroplane owners of many years' standing.

Perhaps the most unusual flying career of any Airwork pupil, that of Mr. Henry Winch, reached the normal starting point, the "A" licence, a few days ago, after sixty hours' solo flying experience spread over a period of seven years. This, on the face of it, is odd, and becomes still more so when it is remembered that Mr. Winch, who learned to fly with Capt. Baker in 1929, was, and still remains, Airwork's star pupil. He started at Heston with no previous piloting experience, and after 2 hours 20 minutes' dual on a Moth, Baker sent him solo because he could find no justification for keeping him any longer on the leading-rein. This record has never been equalled, or even approached, at Heston, where the average dual instruction required nowadays on the easier Cadet is about seven hours. The remainder of his flying to date has consisted mainly of passing the "A" licence tests at various times and then forgetting to do anything about sending in his papers. He piled up solo experience within the three-mile limit for unlicensed pilots. He bought a wartime S.E. single-seater fighter, was misinformed about its landing speed and overshot Brooklands in trying to land it much too fast, found his way to Heston in the fog prevailing that day and got down successfully in Heston's larger area.

Private Flying

SOUTHEND

There are ten new members, including one lady—Miss Squire. Mr. W. J. Perkins is a new "A" licence pilot. One of the Club machines took part in the film *Splinters in the Air* at Iver last week.

CAMBRIDGE

Machines of Marshall's Flying School flew 65 hr. 35 min. during the week ending October 25, although high winds prevented flying on the 19th. Messrs. Owen, Calthorpe, Hood and Walter have joined the School.

C.A.S.C.

In face of adverse weather a number of members made short flights last Sunday, totalling 4 hours. The Corps annual dance will be held at the First Avenue Hotel on February 18. Tickets may be obtained from Mr. R. A. Carter, 127, Avondale, S.E.21.

NORFOLK AND NORWICH

The Club has recently issued a prospectus introducing an idea intended to induce the holiday seeker to Norwich. The scheme is planned specially for professional and business men and members of the Services who have three or four weeks' holiday to fill in and consists briefly of combining their normal holiday with a course of flying. Mr. R. D. Hesketh has become a flying member.

CROYDON

In spite of poor conditions, 50 hr. 45 min. flying was logged last week. Mr. C. W. Carswell made a successful night flight to Lympne for the "B" licence and Mr. E. B. F. Auld went solo after 5 hr. 30 min. dual. On Saturday Mr. L. G. Wise showed an aviation film in the clubroom. Lord Beaverbrook has consented to become the first president and will preside at the inaugural dinner on November 28.

MIDLAND

Flying times for the week ending October 22 were 9 hr. 30 min. dual and 6 hr. 20 min. solo. Messrs. S. J. Thrackray and S. B. Yardley have joined as flying members and Mr. K. J. Bartlett as an ordinary member. A landing competition, open to members, will be held on Sunday, November 1, for the *Evening Despatch* trophy. A first, second and third prize will also be presented by the Club. On November 27 the annual dance will be held at the Botanical Gardens, Edgbaston.

An Eastbourne International

PROPOSALS have been put forward for an International Coronation Aerial Rally and Garden Party at Eastbourne, May 14 and 15, 1937. Events will include an arrival competition, demonstrations of latest civil and commercial types, and a *Concours d'Elegance* and aerobatics competition for cash prizes and cups. A ball at the Winter Garden will terminate the meeting on the Saturday night.

Invitations are being sent to aero clubs in Germany, France, Belgium and Holland. It is suggested that a cup and cash award be given to the pilot arriving from the longest distance. The venue will be the Eastbourne Flying Club aerodrome at Wilmington. Captain E. I. Short, 31, Cornfield Road, Eastbourne is organising the event on behalf of the Eastbourne club.

The One and Only

IT is interesting to discover that the Air Ministry notice to aircraft owners and engineers No. 32 of this year, requiring a modification to the engine mounting of the Monospar ST.25, was not only issued on recommendation by General Aircraft, but is the first one to be issued for the Monospar since the original machines were built in 1929. Which, it must be admitted, is fairly good going.

Business as Usual

DESPITE the fire which broke out on Saturday and caused a considerable amount of damage, the Brooklands Flying Club put in some fifteen hours' flying on Sunday. Business is, in fact, going on as usual, and, though the offices were burnt, telephonic communication has been restored.

This fire started under the engine shop from a cause that is, as yet, unexplained, and spread very rapidly so that the first large hangar was ablaze within a very few minutes and the second hangar soon followed. Members, instructors and mechanics demonstrated great loyalty and courage in removing all machines save six. The rescued craft were housed, through the generosity of Mr. Maxwell Muller, the American director of Vickers, in this company's flight shed. It is more than a pity that the engine shop should have suffered, since this was one of the best in the country, outside the repair shops of manufacturers.

Pilots' Paradise?

THE decision of the South African Minister of Defence, Mr. O. Pirow, to subsidise flying clubs and pilots has given a tremendous fillip to the flying-training business. The Government's scheme is so generous that young men who qualify for the Reserve find that their flying has cost them nothing, while those who do not continue after obtaining their "A" licences are also relieved of a considerable amount of their flying expenses.

There has for some time been more than one active flying club on the Rand, but it is in Durban where the greatest comparative increase in activity has taken place. About eighteen months ago the old Durban Light Plane Club ceased to exist. The announcement of the subsidy led immediately to the formation of a new club, and in one year the fleet has increased from one to seven, the staff from one to eleven, the members from three to forty, and sixteen "A" licences have been obtained.

The Department of Defence estimate assumes a supply of 325 pilots of fifty hours' experience yearly, but this does not take into consideration the pilots who are being trained under the Department's University scheme or those in training at Roberts Heights. The Government has now also approved a scheme by which any experienced pilot who wishes to be trained as an instructor can obtain free a three-months' course at military headquarters. Arrangements are also being made for the introduction of a special South African navigators' examination.

LOW-WING TRAINER: An impressive "aerial" of one of the latest Miles Hawk Trainers to go into service with the Reserve school at Woodley. Its number may cause consternation when (and if) it is used for a first solo.

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FLAPS and PITCHING MOMENTS

A Simple Method of Estimating

By A. E. RUSSELL, B.Sc.

WING flaps, of one sort or another, have become an essential part of a modern aeroplane. Their effect on the lift and drag characteristics of an aerofoil is too well known to reiterate here. It is also generally appreciated that they affect the balance in pitch or "trim" due to a change in centre of pressure on a wing, and also in the downwash behind the wing. A simple method is outlined here, whereby the change in the centre of pressure may be estimated with a good degree of accuracy. The results given in American N.A.C.A. Report 539, "Investigation of full scale split trailing-edge wing flaps with various chords and hinge locations," will first of all be analysed.

Commencing with cases where the flap trailing edge coincides with the wing trailing edge, the change in pitching-moment coefficient, $\triangle Cm\ c/4'$ is plotted against the increase of normal force coefficient $\triangle Cnw$ in Fig. 1. A mean line is drawn through these experimental results and its equation may be written

$$\triangle Cm\ c/4 = -.25\ \triangle Cnw$$

From which it appears that the increment of lift due to flaps may be considered as concentrated at a point .25 chords aft of the datum considered, i.e. at .5 chords from the leading edge.

This conclusion has been applied to R. & M. 1636, "Tests on aerofoil flaps in the compressed air tunnel," taking the unflapped characteristics from R. & M. 1543, "Wind Tunnel tests on Aerofoils 38 and 48."

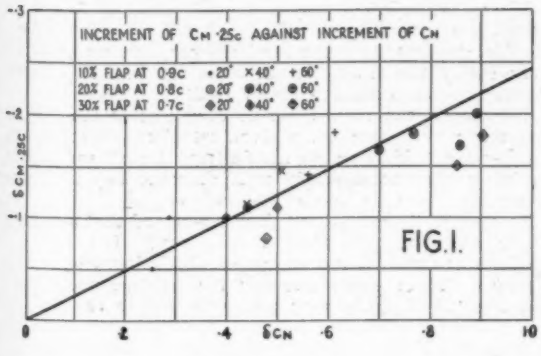
Selecting at random four test results for 0.10 c. and 0.0375 c. flaps having their hinges at 0.90 c. and 0.962 c. respectively, the calculations are given in Table 1.

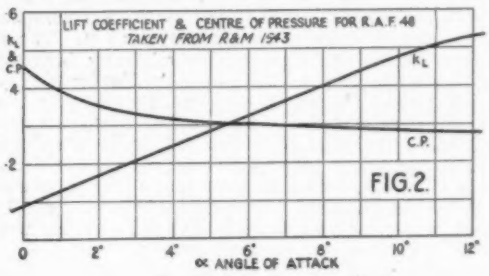
TABLE I.

(1) α	(2) k_{LF}	(3) k_L	(4) δk_L	(5) CP_1	(6) (3)×(5)	(7) .5×(4)	(8) (6)+(7)	(9) CP_2	(10) CP_3
0	.427	.090	.337	.455	.0410	.168	.209	.483	.466
8.4	.730	.420	.310	.291	.122	.155	.277	.379	.379
4.0	.455	.248	.207	.320	.080	.103	.183	.402	.412
11.3	.742	.514	.228	.280	.144	.114	.258	.348	.357

where k_{LF} = flapped lift coefficient.
δk_L = increment of lift due to flaps.
CP_1 = unflapped centre of pressure.
CP_2 = calculated " "
CP_3 = measured " "

The agreement between CP_2 and CP_3 is seen to be good.





Extending the method to cases where the flap trailing edge lies forward of the wing trailing edge, it becomes necessary to find the position on the wing chord at which the increment of lift must be considered.

To find this position in a particular case the results given in Table 6 of R. & M. 1636 are analysed in Table 2.

TABLE 2.

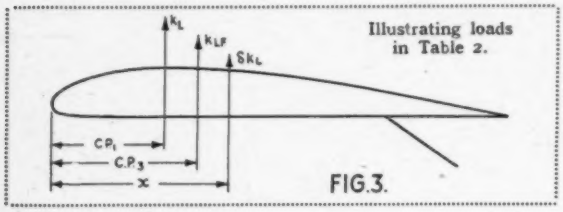
R.A.F. 48 aerofoil with Schrenk flap 0.2 c. width, hinge at 0.6 c. from leading edge.
From Fig. 3.

$$\frac{k_L \times CP_1 + \delta k_L \cdot x}{k_{LF}} = CP_2$$

(1) a	(2) CP_2	(3) k_L	(4) CP_1	(5) (3)×(4)	(6) k_{LF}	(7) δk_L	(8) (5)÷6	(9) (2)−(8)	(10) (9)×(6)÷(7)
.1	.326	.099	.455	.045	.504	.405	.089	.237	.295
4.4	.312	.262	.315	.082	.590	.328	.139	.173	.311
8.6	.298	.425	.290	.123	.724	.299	.170	.128	.310
11.7	.291	.525	.280	.147	.799	.274	.184	.107	.312

Column (10) shows that the position at which the increment of lift occurs is still constant, and suggests this position to be 0.5 c. forward of the trailing edge in the closed position.

This conclusion will be checked for the other cases given in R. & M. 1636 and N.A.C.A. Report 539 in Table 3.



Illustrating loads in Table 2.

FIG. 3.

TABLE 3.

(1) Flap Chord	(2) Hinge Postn.	(3) a	(4) k_{LF}	(5) k_L	(6) δk_L	(7) CP_1	(8) (5)×(7)	(9) $x\delta k_L$	(10) (8)+(9)	(11) CP_2	(12) CP_2
From R. & M. 1636.											
0.1	0.75	.15°	.382	.10	.282	.450	.045	.099	.144	.377	.382
0.1	0.75	8.6°	.666	.425	.241	.290	.123	.085	.208	.312	.323
0.1	0.60	4.6°	.490	.270	.220	.315	.085	.044	.129	.264	.288
0.1	0.60	8.7°	.614	.429	.185	.290	.124	.037	.161	.262	.277
0.2	0.75	8.4°	.800	.417	.383	.292	.122	.172	.294	.367	.346
From N.A.C.A. Report 539.											
0.1	0.68	—	.96	.60	.36	.275	.165	.101	.266	.277	.30
0.1	0.80	—	.99	.60	.39	.275	.165	.156	.321	.324	.335
0.2	0.68	—	1.21	.60	.61	.275	.165	.232	.397	.328	.330

Generally it is seen that agreement between the calculated and measured centres of pressure is good, the average difference being less than 2 per cent. of the chord.

CONCLUSION.

The centre of pressure on a wing with flaps is given by

$$\text{C.P.} = \frac{k_L \text{C.P.}_1 + \delta k_L x c.}{k_L + \delta k_L}$$

where k_L = lift coefficient, flaps closed.
CP_1 = centre of pressure, flaps closed.
δk_L = increment of lift coefficient due to flaps.
x = position on chord, .5 chords ahead of trailing edge of flap in closed position.

EFFECT of FLAPS on TAKE-OFF

Calculations Made for N.A.C.A. Indicate That a Considerable Improvement is Possible : Fowler and External Aerofoil the Most Effective

THE present trend towards very high speeds and higher wing and power loadings in aeroplane design lends increased importance to the problem of improved take-off performance. Controllable and automatic airscrews have proved to be of considerable value in reducing take-off distances, but, with these exceptions, little else has been accomplished towards this end.

A number of high-lift devices has been developed to compensate for the effects of high wing loading and clean lines on landing performance. Those of the flap type have proved very satisfactory for use on high-speed aeroplanes, since they not only provide the desired effectiveness in landing, but also cause little or no detriment to the maximum speed.

In order to determine whether or not trailing-edge flaps could be expected to have any beneficial effect on take-off performance, Mr. J. W. Wetmore, for the American National Advisory Committee for Aeronautics, has calculated the distance required by hypothetical aeroplanes to take off and climb to an altitude of 50 ft. The aircraft corresponded to the modern relatively high-speed type, and the types considered were the Fowler wing, the Hall wing, the Schrenck or split flap, the plain flap, and the external aerofoil flap. The results, which are issued as N.A.C.A. Technical Note No. 568, indicate that substantial reductions in take-off distance are possible through the use of flaps, provided that the proper flap angle corresponding to a given set of conditions is used. The best flap angle for taking off varies inversely as the power loading, and, to a much smaller extent, varies inversely with wing loading. Apparently the best take-off characteristics are provided by the type of device in which the flap forms an extension to the main wing, as in the case of the Fowler wing, and by the external aerofoil flap.

For the Fowler wing and external aerofoil flap the shortest total distance with the flaps deflected to their best angle is apparently realised when the take-off is made at a lift coefficient of about 78 per cent. of the maximum, regardless of the loading condition. For all the other devices considered, the lift coefficient giving the shortest take-off distance, although independent of wing loading, varies from about 82 per cent. of the maximum lift coefficient to about 89 per cent. at the highest.

Flap Angle

The variation in best flap angle with power loading may be fairly large. The magnitude of this variation differs considerably among the several devices, but its trend is very nearly the same. In all cases the best flap angle decreases with increasing power loading.

No general conclusions can be drawn as to the proper flap angle to be used for a given set of conditions, as it varies rather widely among the different devices and would probably vary considerably with different flap sizes for the same device.

In making the calculations it was assumed that an automatic airscrew, permitting development of full rated engine speed and brake horse power at all airspeeds, would be used. The report states that it should be noted that the results will apply very nearly as well to the case of the controllable-pitch airscrew with a single blade-angle setting for the low-speed range, since in this range the optimum blade angle varies only slightly.

REINFORCED WOOD AIRSCREWS

Details of the Heine System : Manufacture in This Country to Begin at Once

PROGRESS has been made with the manufacture of the Jablo airscrews in this country under licence from the German Heine company. As announced in *Flight* of October 15, Jablo, Ltd., of Brettenham House, Strand, own the sole rights in this country, and manufacture is starting almost at once in works at Ipswich, where an up-to-date plant for airscrew manufacture is installed. Details cannot be disclosed at the moment, but an announcement is likely to be made next week.

Fundamentally, the Heine airscrew, which has achieved very considerable popularity in Germany, is the ordinary laminated-wooden airscrew made impervious to the effects of temperature and moisture. It is in the method of covering and protection from these conditions that the main interest lies.

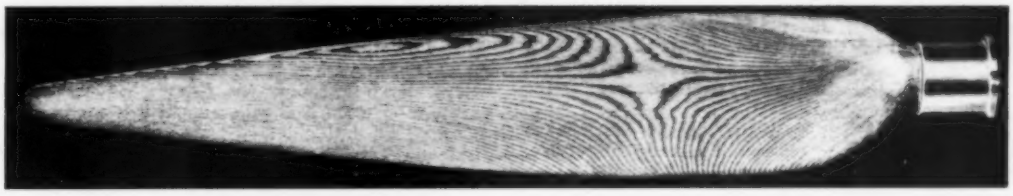
The Heine airscrew is first manufactured in the usual way, except that a kind of synthetic resin is used instead of glue for cementing the laminations together. Another kind of synthetic resin is sprayed over the surface of the airscrew, and, while this is still "tacky," a steel gauze is applied, covering the outer three-quarters or so of the blades. This gauze is wrapped around the blade and the leading edge, the single joint being made on the trailing edge. The steel gauze, it might be mentioned, is coated with copper to protect it against corrosion. When the first layer of synthetic resin has thoroughly set, the gauze has become firmly embedded in it, and forms a sort of gaiter virtually cemented to the wood, and it cannot possibly slip. A narrow strip of brass is soldered to the gauze along the leading edge, and the whole is covered with a coat of self-hardening glaze, which has a very high polish and a remarkably hard surface, and is unaffected by heat and moisture. By securing the leading edge capping strip to the gauze by soldering, it becomes possible to use airscrew sections with a thin, pointed leading edge, as no nails or wood screws are used, which might split the wood and lead to ultimate failure.

From a manufacturing point of view, one of the great advantages of the Heine system and of the particular synthetic resins employed is that the protective covering can be applied by spraying, without requiring heat or pressure. To the user there should be a considerable advantage in the fact that the resins are quite transparent, so that the grain of the wood can be seen clearly, even through the steel gauze; thus any signs of defects beginning to develop after very prolonged use, or after some mishap or other, can be detected by simple visual inspection of the airscrew.

It is interesting to recall here that in Germany the Heine company manufactures many of its airscrews of soft woods, which are cheaper and lighter than the hard woods usually employed in this country. There is, of course, no necessity to do this, and probably the first airscrews to be built at Ipswich will be of hard wood.

The original German makers claim that in addition to the weather protection afforded by the impregnation with synthetic resins, the mechanical properties of the wood are improved considerably. For example, the tensile strength is improved by about 14 per cent., the bending strength by 25 per cent., and the resistance to splitting by about 300 per cent. All these improvements make it possible to use thinner airscrew sections, with resulting gain in aerodynamic efficiency.

So far mention has been made of ordinary fixed-pitch airscrews only. Considerable progress has been made with the manufacture of detachable airscrew blades as a step towards the variable-pitch airscrew with wooden blades. By an interesting process, the details of which cannot be disclosed at the moment, the blade roots are compressed and fitted into a metal sleeve. The degree of compression varies, increasing as the airscrew hub is approached, so that not only are the tensile and shear strengths increased, but the mechanical properties are proportioned to the loads at any point. The photograph illustrates a small airscrew blade made in this way.



A small Heine detachable airscrew blade. The wood at the root is highly compressed.

Designers will be interested in the following figures, which show the mechanical properties obtained on test. No information is, unfortunately, available concerning the wood used and the diameter of the airscrew.

	Blade Root.	Blade.
Specific weight (g/cm^3)	1.36	0.81
Tensile strength (kg/cm^2)	2,200–2,400	1,400–1,600
Bending strength (kg/cm^2)	2,100–2,300	1,300–1,500
Brinell hardness (kg/cm^2)	1,850	1,140
Shear strength (kg/cm^2)	220–230	120–160

This table brings out the degree to which the mechanical properties of the blade root are improved by compressing the wood.

Among German aircraft fitted with Heine airscrews may be mentioned the Zeppelin airship *Hindenburg*, which has three-bladed adjustable-pitch airscrews made of wood and treated in the manner described. Large numbers of civil and military aeroplanes are fitted with the Heine.

Case-Hardening Steel

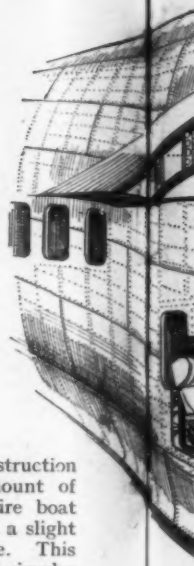
No. S.90. High Tensile 5 per cent. Nickel Case-Hardening Steel.

THE above Specification has just been issued by the British Standards Institution for Aircraft purposes and is a revision of and replaces B.S. Specification No. S.83. The alteration to the specification number has been necessitated by a slight reduction which has been made in the mechanical test figures owing to the difficulty of obtaining the values specified in S.83 from the standard 1¼in. diameter test samples. The up-ending test is no longer required on bars and billets for forging, and the procedure for selecting test samples has been modified.

The price of this Specification is 1s 2d., post free.

THE CONSTRUCTION of the EMPIRE BOATS

First Detailed Description and Sketches of the Structure : Clever Types of Construction Used in Wings and Hull : Light Metal Employed Throughout, with a Few Stainless Steel Fittings

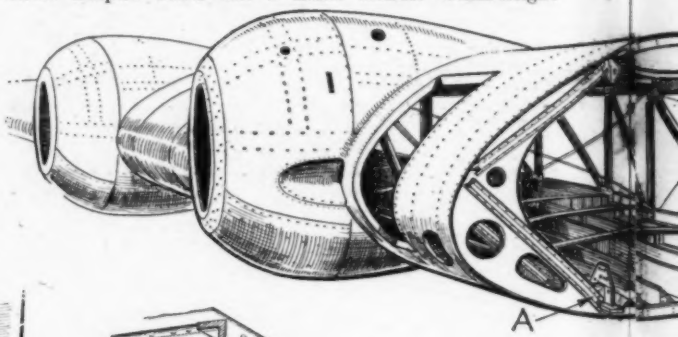


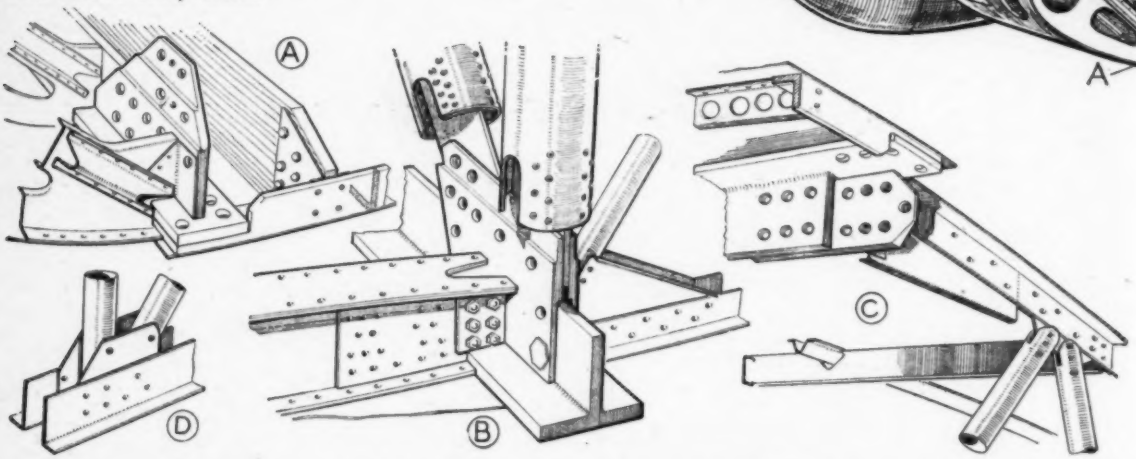
A CONSIDERABLE amount of information has been published about the passenger accommodation and general layout of the new Empire flying boats which Short Brothers, of Rochester, are building for Imperial Airways, Ltd., and some further important details appear elsewhere in this issue. The boats are intended, in the main, for the England-South Africa and England-Australia routes, although a few will be modified slightly in the matter of fuel tankage in order to give them sufficient range for making the flight across the Atlantic, both *via* Bermuda and *via* Newfoundland. Hitherto the details of the construction have been kept secret, but now that the first two boats, *Canopus* and *Caledonia*, have carried out their test flights and have been found to fulfil all the expectations of the designers, it has become possible to describe the constructional details, which *Flight* is placing before its readers for the first time this week.

Some surprise has been expressed at the fact that a large batch of these machines is not already in service. By the time the reader has perused the sketches which illustrate this article, and has studied the numerous details of the construction, he will realise the magnitude of the task with which Mr. Bibby, Short's works manager, was confronted. Let it be remembered that the original order was for a total of 29 of these large, four-engined flying boats, and that at the time the works were only normally busy, so that a very large expansion was needed. For example, apart from questions of jigging and tooling, the number of workers had to be nearly trebled, and with every firm in the aircraft industry competing for skilled workers, this was no easy matter. Ultimately the solution was found in getting hold of as many skilled workers as possible, completing the number with unskilled or semi-skilled workers who had to be taught the intricacies of flying boat work before they could become really useful.

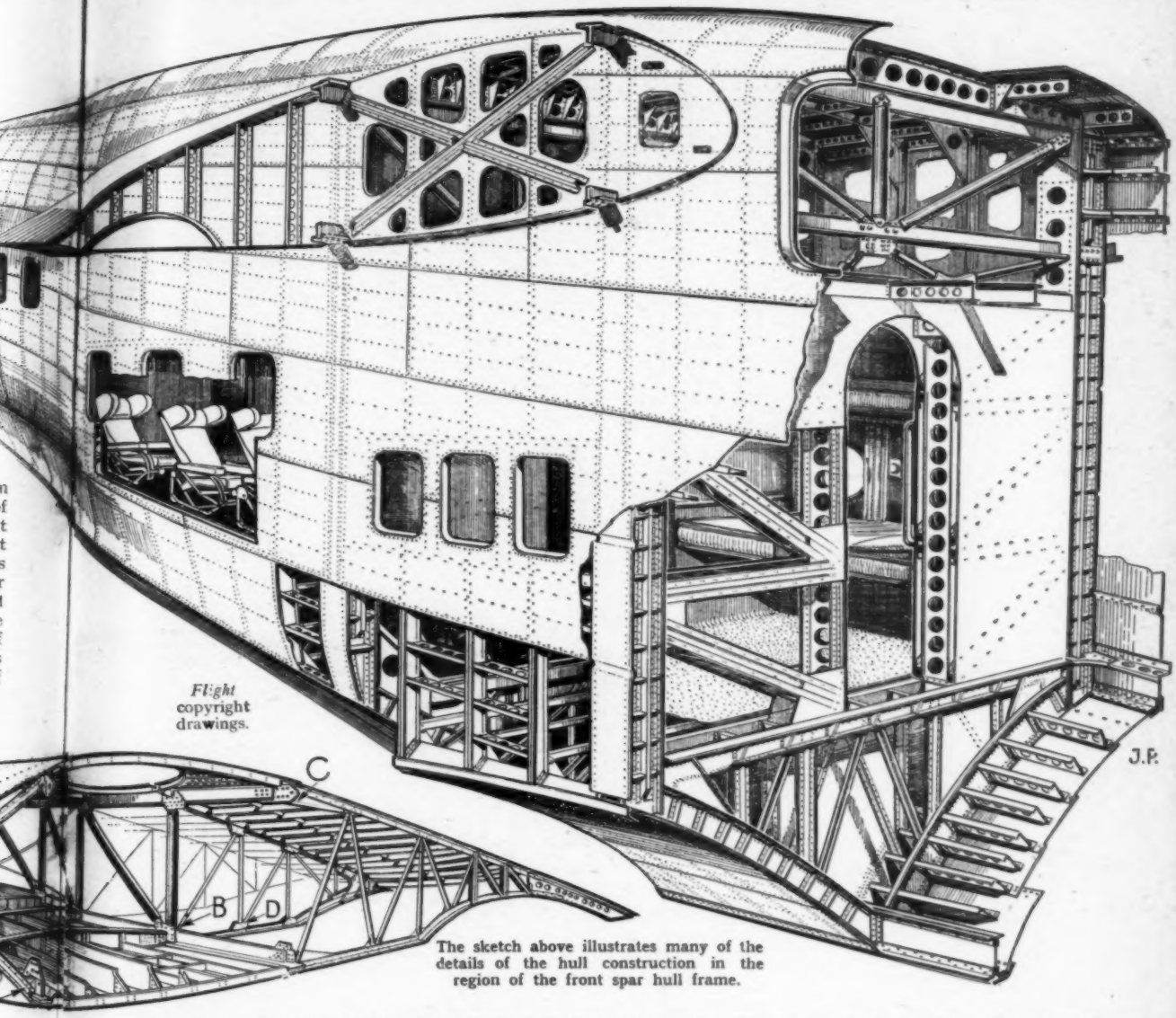
The Short Empire flying boat is an all-metal four-engined cantilever monoplane, with the usual two-stepped hull. The lines of the hull differ, however, somewhat from those of earlier Short flying boats, and the wing structure is entirely new as far as flying boats are concerned, although it has been thoroughly tested-out on the small Short Scion landplanes.

Earlier Short flying boats, such as the Calcutta and Kent class, were characterised by a reduction in beam above the chines, the sides being faired into the chines by a planking of double or "S" curvature. That form of construction was comparatively difficult, and a certain amount of "panel beating" was inevitable. In the Empire boat the double curve has disappeared and there is but a slight hollow curve sweeping the sides into the chine. This shape was chosen partly because it is a good deal simpler to construct, but chiefly because the space was wanted inside for cabins. In order to utilise the space to the best advantage, it was also decided to keep the beam of the hull relatively narrow and to arrange the quarters of passengers and crew on two "decks." A result of these various considerations was that the hull of the Short Empire boats has a much smaller beam-height





Details of the construction of the centre-section of the wing. The locations of the different joints are shown in the general sketch. Attachment of the leading edge to the spar is shown at A ; a typical joint between the extruded spar flange and the N-girder of the spar at B ; the wing spar joint is illustrated in C, and a rib joint at D.



The sketch above illustrates many of the details of the hull construction in the region of the front spar hull frame.

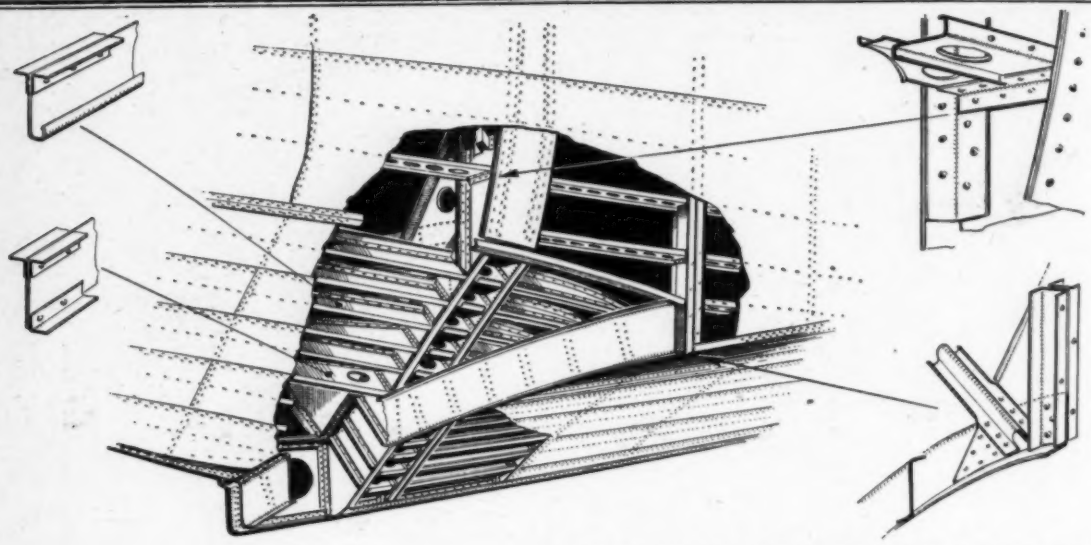
ratio than earlier Short boats, although the hull does not quite achieve the "plank-on-edge" proportions of some of the Rohrbach flying boats, for example.

From a seaworthiness point of view, the great height of hull is a considerable advantage in that it gets the engines and airscrews well clear of flying spray, although against this must be offset a much smaller disadvantage in that the struts which carry the outboard wing floats are slightly increased in length. In this connection it should, perhaps, be made clear that lateral stability on the water has not been reduced by the new beam-height ratio, as it has been a case of increasing the height rather than of reducing the beam.

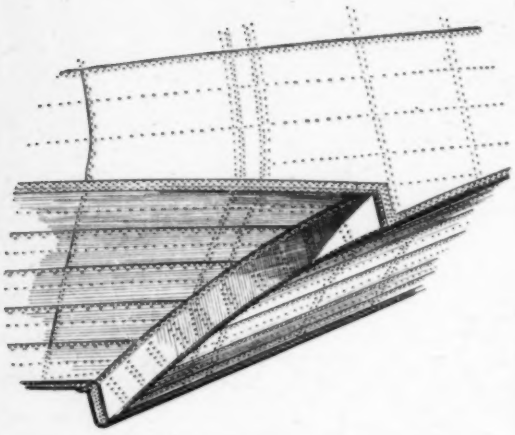
Apart from the difference in the shape of the hull sides, changes in design are also to be found in the steps, notably the front one. Hitherto it has been customary to run the main step straight across the hull, that is to say, with the step forming a straight line in plan view. In the Empire boats a slightly different arrangement has been employed. The step is no longer vertical but may be regarded as sloping forward at an angle. This is done by having the points where the outer ends of the step meet the chines located ahead of the point where the step crosses the chine. This arrangement brings the transverse plane through the step into a forwardly-sloping attitude. Judging by the clean running and absence of "porpoising" the new step arrangement is a success and the length of the take-off certainly does not appear to have suffered as the machine gets off remarkably well.

In the construction of the hull, usual Short practice has, generally speaking, been retained, although certain detail differences are met with here and there where the increase in size and slight change in shape has made such changes profitable. Structurally, the keel and the two chines form a triangulated structure in section. The keel is a built-up I-beam, with a single flat sheet for the flange and L-sections riveted through the flange edge to form the top and bottom flanges of the I. The keel is lightened by circular holes in the web, the holes having their edges slightly flanged over to stiffen them.

The transverse frames are mostly of Z-section between



The main step slopes forward, as shown in the sketch on the left. Details of the step and frame construction are illustrated above.



keel and chines, and the top horizontal member of the triangular construction referred to above is of channel section, braced to the planing bottom frames by "N" ties. These latter are of what may be described as "open omega" section.

Between chines and gunwales the vertical frame members are mostly plain double-channel sections, the two channels being placed back-to-back.

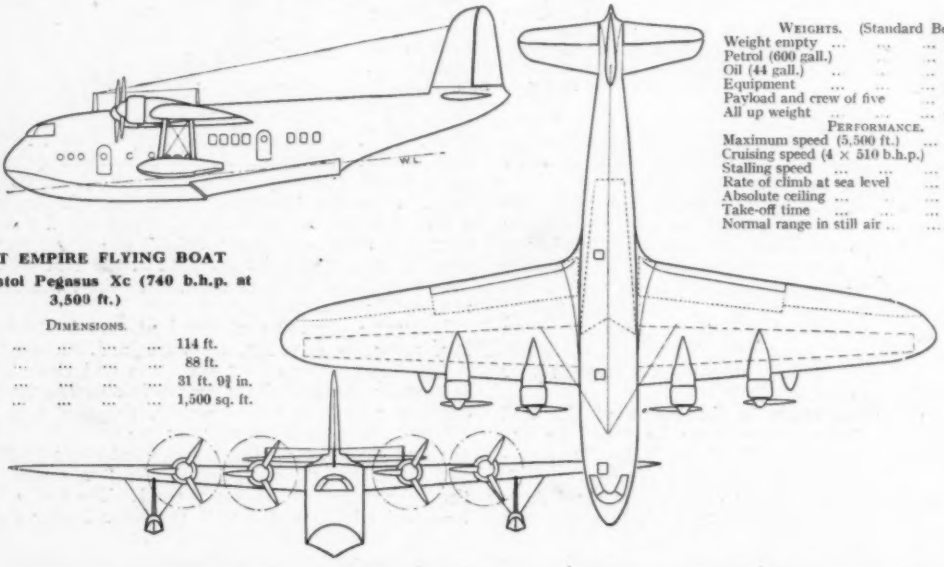
Short Brothers were the first British constructors to use a form of metal-clad construction in which the longitudinal members or stringers were interrupted at the frames. Previously it had been customary, when flying boat hulls were built of wood, to notch the stringers into the frames so as to get all longitudinal members running continuously from end to end. The Short method has been retained in the Empire boats, the stringers being in short lengths between frames, to which they are

SHORT EMPIRE FLYING BOAT

Four Bristol Pegasus Xc (740 b.h.p. at 3,500 ft.)

DIMENSIONS.

Span	114 ft.
Length	88 ft.
Height	31 ft. 9¼ in.
Wing area	1,500 sq. ft.

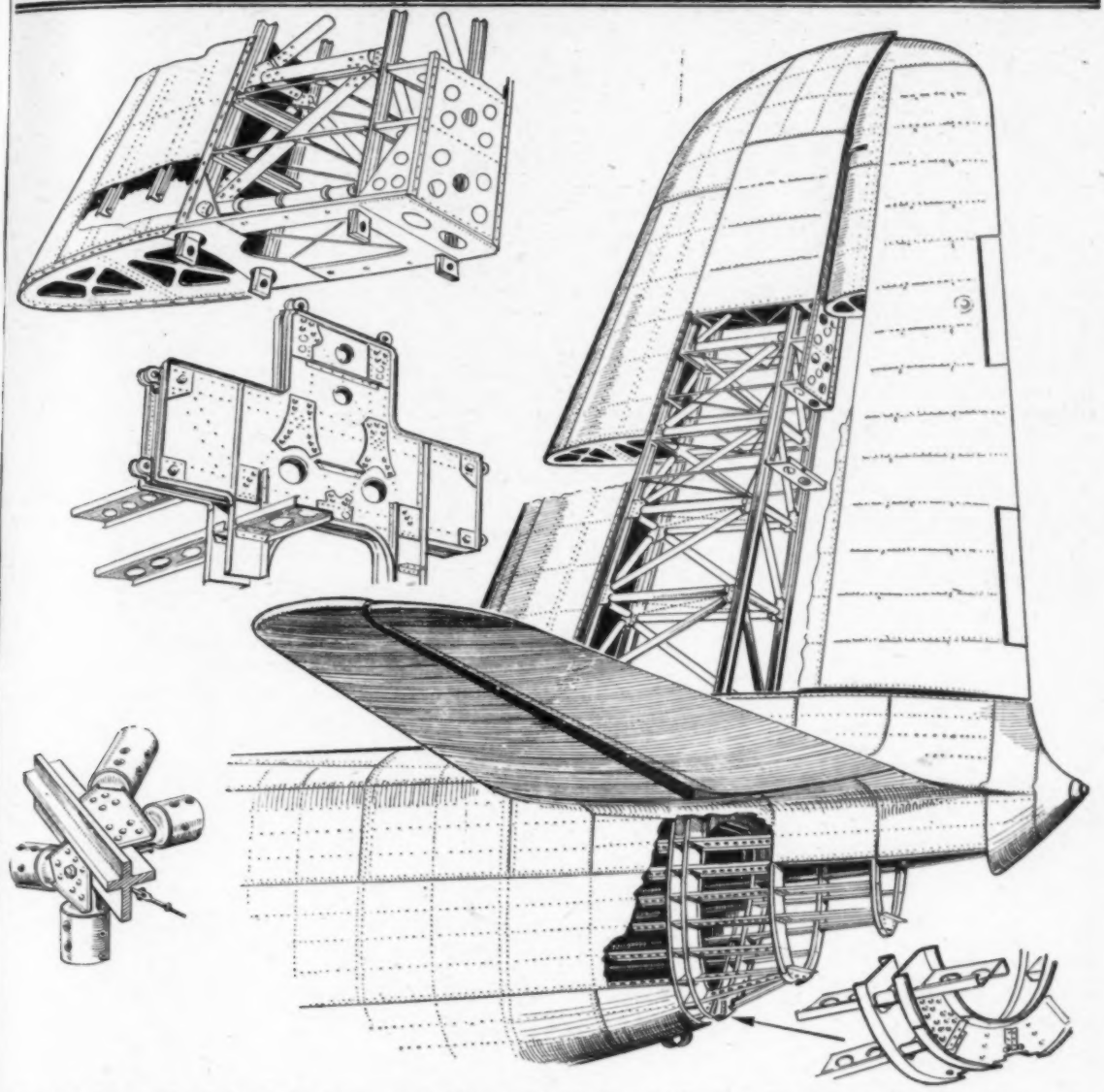


WEIGHTS. (Standard Boat.)

Weight empty	24,000 lb.
Petrol (600 gall.)	4,560 lb.
Oil (44 gall.)	400 lb.
Equipment	3,340 lb.
Payload and crew of five	8,200 lb.
All up weight	40,500 lb.

PERFORMANCE.

Maximum speed (5,500 ft.)	200 m.p.h.
Cruising speed (4 × 510 b.h.p.)	165 m.p.h.
Stalling speed	73 m.p.h.
Rate of climb at sea level	950 ft./min.
Absolute ceiling	20,000 ft.
Take-off time	21 sec.
Normal range in still air	760 miles.



The tail unit of the Empire Boat. The upper sketches on the left show details of fin attachment to the double frame, and the lower sketch illustrates the joints of the bracing tubes in the fin to the cruciform-section fin spars.

attached by plain angle brackets and by gussets over the frame flanges. In the original Short boat hulls, the stringers were of an open vee section. In the Empire boats, however, the stringers are of Z-section. The Alclad sheet planking is joggled where two edges overlap, and the stringers themselves have their flanges indented to accommodate the joints of the planking. In this way a perfectly smooth surface results.

Aft of the rear step, the hull frames are of channel section from the keel to the decking, which is deeply cambered.

As already mentioned, the new hull form is such that double curves and S curves have disappeared. The result is that with one or two exceptions there is no need for panel beating, and the sheet planking can be applied in quite large panels. Countersunk rivets are used, so that the hull planking presents an absolutely smooth surface.

Some very interesting innovations have been introduced in the wing construction of the Short Empire boats. The fundamentals of it were tried out in the little Short Scion landplane, which was also in other respects something of a flying model of the Empire boats and provided many data which were applied in the design and construction of the large machine.

In his lecture to the Royal Aeronautical Society recently, Dr. Lachmann referred to two main types of cantilever wing construction, the shell type of stressed skin and the "concentrated flanges" type. The Short form of wing construction belongs to the latter. The main wing spar is a girder box, the four corners of which are formed by extruded T-sections of light alloy. The "box" tapers both in plan and depth, and the extruded T-sections taper in size and thickness, the taper being obtained by machining. Thus the material is at all points along the span proportioned to the stress at that point. The front and rear sides of the spar "box" are formed by tubular members arranged as "N" girders. These girders are, of course, in the planes of what are front and rear spars in a more orthodox two-spar wing.

The method of attaching the tubes to the T-section

flanges is interesting. A plug of what may be described as I-section with curved flanges is inserted in the end of the tube and riveted to it. To facilitate the riveting process, portions of the tube walls are cut away at the end, and in this manner the rivet positions become quite accessible. The central web of the plug extends beyond the end of the tube, the extension being attached to the single flange of the T-section spar flange by fish-plates, as shown in a sketch.

Ordinarily, there would be wing ribs between the front and rear walls of the spar "box." In the Short construction there are none of these ribs; instead, there are Z-section stringers which run span-wise, and the upper flanges of which support the sheet-metal wing covering. These stringers are in turn supported on fore-and-aft members which occur only at the points where there are uprights in the front and rear spar girders. The "box" section is prevented from assuming a rhomboidal shape by incidence wires running diagonally between front and rear spar box corners.

LE and TE

To the main wing "box" the leading and trailing edges are attached as complete units. The leading edge is entirely of sheet construction, with short nose ribs and curved leading edge covering forming a half-open shell, attached to the main spar box corners. When the leading and trailing edge units are removed, they give complete access to the interior of the wing "box" and all its details.

The trailing-edge unit is built up, girder-wise, the tails of the ribs having T-section flanges inter-braced by tubular members.

A special type of trailing-edge flap is used on the Empire boats. The section of the flap is a segment of a circle, and the flap moves back and down so that it provides both increased area and increased camber.

Wing Covering

The covering of the entire wing is of light-metal sheet, and flush-riveting is used extensively so that the wing surface is particularly smooth.

A particularly neat type of engine support has been designed for the Empire flying boats. The Bristol Pegasus engine is carried on a metal *monocoque* support, which is cantilevered out from the front of the spar "box," and which fairs very neatly into the wing covering. The main petrol tanks are cheese-shaped, and there is a pair of them between each engine pair.

Special beaching undercarriage legs have been designed for the Empire boats, and are provided with air bags so that when they are cast off they will not sink.

From the data on p. *26* it will be seen that the ratio of gross to tare weight is 1.69, which is a good figure for a boat of this size.

Most of the structural features have been dealt with in above article. Readers who are interested in the general layout, furnishing and equipment of the Empire boats are referred to the article on pp. 430-434, which deals more particularly with these features.

TECHNICAL LITERATURE

"Elements of Practical Aerodynamics." By Professor Bradley Jones, M.S. Publishers: Chapman and Hall, Ltd., London. Price 18s. 6d. net.

ALTHOUGH this book is entitled "The Elements of *Practical* Aerodynamics," it was not written for practical engineers. The author, who is Professor of Aeronautics at the University of Cincinnati, writes in his preface that his experience of teaching has convinced him that the classroom student requires a text book written primarily for him.

The earlier chapters deal with the atmosphere and airflow, aerofoils, induced drag and parasite drag. These are well written and give not only the mathematical statements, but the physical conception of what happens. There are many examples, both worked and for the student to work himself, so that his interest will be maintained and the text well driven home. Professor Jones avoids the calculus although one would suppose the student to be taking a parallel course in mathematics and mechanics. He avoids the proof of Prandtl's statement that with semi-elliptical lift distribution the "swept-area" is a circle whose diameter is the span, and merely states the fact. This is, perhaps, allowable in a first elementary survey of the subject.

The author then passes by way of an inadequate chapter on engines and a good one on airscrews to the problems of performance and stability, again well illustrated with examples. Had the book ended here one would have said that it was excellent for its purpose, in spite of details about which one could argue. The chapter on Construction and Materials, ten and a half pages long, would tell nothing new to a schoolboy. Then follows thirty pages on instruments and short chapters on meteorology, "Avigation," and aerostatics. These are inadequate for the serious student.

Now that we in this country have adopted the C_l and C_d coefficients, American books become much less confusing to our beginners, who may now be expected to know the difference between C_l and the k_L of the "absolute" units. M. L.

SUMMARIES OF AERONAUTICAL RESEARCH COMMITTEE REPORTS

REPORTS published by His Majesty's Stationery Office, London, which may be purchased directly from H.M. Stationery Office at the following addresses: Adastral House, Kingsway, W.C.2; 120, George Street, Edinburgh; York Street, Manchester, 1; St. Andrew's Crescent, Cardiff; 15, Donegall Square West, Belfast; or through any ordinary bookseller.

THE CONTRIBUTION OF THE BODY AND TAIL OF AN AEROPLANE TO THE YAWING MOMENT IN A SPIN. By H. B. Irving, B.Sc., A. S. Batson, B.Sc., and J. H. Warsap, of the Aerodynamics Department, N.P.L. R. & M. No. 1689. (16 pages and 28 diagrams.) November 29, 1935. Price 2s. net.

Two points of great importance in spinning have been known for some considerable time. They are, first, that a yawing moment acting against the spin is the most effective means of preventing the flat spin or of bringing an aeroplane out of a spin. Second, that the fin and rudder, whose function it is to provide such an anti-spin yawing moment, are liable to become very largely shielded or even reversed by the tailplane during spinning.

Broadly, the effects due to the following were studied:—Change of profile and plan form. Change of body section (flat, square, circular, rectangular, elliptical, semicircular top, semicircular bottom). Addition of narrow strips along these last two bodies thus, Variation of tailplane aspect ratio and shape. (Aspect ratios 2, 3 and 4—rectangular—and triangular). Variation of tailplane position (fore and aft and up and down). Variation of disposition of a given vertical fin surface, (e.g., tall vertical surface, long vertical surface and surface below tailplane each side of plane of symmetry).

Wing interference was also studied in a number of cases both as regards the magnitude of the interference due to wings of different arrangements (high and low wing monoplane, and biplane) and as regards its effect on the comparison of body and tail.

There is scope for wide differences in the yawing moment in a spin given by bodies of the same profile but of different cross section. When the profile tapers to a point at the tail the circular section is peculiarly inefficient. When there is a medium depth of body at the tail the sections of semicircular top and semicircular bottom were respectively the worst and best of those tested. Bodies of elliptical and rectangular section are intermediate between these, the elliptical being better on the whole.

The general trend of the results was slightly in favour of high aspect ratio of tailplane. With the fin and rudder shape adopted as standard, shielding of fin and rudder by the tailplane was also found not to be very sensitive to tailplane position over a range of position from the top to the bottom of the body and considerable fore and aft movement.

Narrow fins (of the order of 1½in. wide, full scale) running along the worst and best bodies made a considerable improvement in each of them. Little is apparently to be gained by extending the fin and rudder upwards (keeping the total area constant) but an appreciable gain may be obtained by fore or aft movement of the centre of area. An important gain was obtained by aft movement of the centre of area combined with forward movement of the tailplane. Fin area placed under the tailplane on either side of the plane of symmetry was very effective; a total area slightly less than half the standard gave a rather better result.

The wing interference experiments gave variable results, the body moment being sometimes reduced and sometimes increased by the presence of the wings to an appreciable extent.

CORRESPONDENCE

The Editor does not hold himself responsible for the views expressed by correspondents. The names and addresses of the writers not necessarily for publication, must in all cases, accompany letters intended for publication in these columns.

BOMBS VERSUS BATTLESHIPS

I WAS interested to read your leading article last week entitled "A Controversy Closed," and I agree with your sentiments on the subject of "bombs *versus* battleships." Nevertheless, the Imperial Defence Committee's finding, that the capital ship is still essential to the fleet, cannot logically be considered to end the controversy.

The tank is vulnerable to the anti-tank gun, and a destroyer stands no chance against a battleship; but no one will deny that both the tank and the destroyer are absolutely essential to our fighting forces. Even if the capital ship stood a very good chance of being put out of action every time it was exposed to air attack, it would probably still be considered essential.

Most of the Imperial Defence Committee's knowledge on the subject must remain secret and confidential; but even the most "anti-aircraft" enthusiast will admit that the air arm has come to have a profound effect on naval strategy and tactics. Meanwhile, such details as bombs and battleships will still lead to lively discussions in the wardroom, the mess and the newspaper correspondence columns.

Walton-on-Thames. E. N. B. BENTLEY, A.F.R.Ae.S.

THE PUPIL'S BÊTE NOIRE

I HAVE been reading with enjoyment the remarks of "Indicator" (September 17) on the right machine for the novice.

Perhaps the time has come to look at *ab initio* training difficulties from a really fresh point of view? To my mind "Indicator" thinks along the right lines when he looks back at his own learning days and wonders how he ever came to do satisfactory landings in standard light biplanes.

Some months ago I first came across a small but distinctly meaty book by one P. W. F. Mills called "The Elements of Practical Flying," and found something with which I expect "Indicator" would agree:—

> "Circuit flying is peculiar to instructional flying, and is as unnatural in relation to everyday flying as stopping and restarting every few hundred yards would be in relation to driving a car. If one cares to work it out, circuit flying may often be found to be on a time basis of twenty-five take-offs and landings to an hour.
>
> "It is hardly necessary to probe deeply into psychology, therefore to discover a reason for the inaptitude which so frequently seems to overtake a flying pupil about the time when landing practice becomes the order of the day."

There is more on this theme, but "Indicator" has probably read the book. Apparently he is not afraid to discuss many subjects about which the beginner or moderately advanced pilot is not encouraged to ask his instructor, and I for one would like to hear his opinion of circuit flying.

I speak as a planter who spent much time and money during a hard-earned leave in England trying to master light aeroplanes. I "went right off" in the usual disheartening and expensive way, and have always felt that intensive circuit practice was to blame. GEORGE S. McCANN.

Sumatra.

["Indicator" deals with our correspondent's point on page 438 of this issue.—ED.]

POWER FOR THE PRIVATE OWNER

I DO not suppose anyone will disagree with "Indicator" ("Topics of the Day," page 416, October 22) in his contention that there exists a demand for the small twin-engined privately owned machine, nor will anyone attempt to disprove the fact that a specially designed engine will be needed. It appears to me that the one great difficulty to be faced is that of the cost of such power units and their maintenance. I think I am not far wrong in stating that the average price per b.h.p. for engines fitted to existing privately-owned aircraft is somewhere in the region of £2 10s. Even assuming that this figure will not be exceeded in the case of a small engine of generally similar design to those now fitted, the total cost of the aircraft, with its duplicated engine mountings and installation, will seriously restrict the field of possible owners.

Although one should not allow the analogy between the car engine and the aero engine to be carried too far, it would appear that car manufacturers have reached a very low figure for the cost of engines, whilst power outputs have steadily increased. Many of the smaller four-cylinder cars with an engine capacity of about one litre are selling at around the £120 mark and developing anything up to 25 b.h.p. at 4,000 r.p.m. An interesting fact about these cars is that their designers have, in many cases, recently reverted from overhead to side valves in their engines.

As I stated in the last paragraph, analogies between water-cooled car engines and air-cooled aero engines should not be drawn too far, but, nevertheless, there seems to me to be a case to be made in favour of the side valve arrangement on the score of low cost, smaller overall dimensions, easier maintenance and lower weight. The disadvantage of lower output per litre is not, I think, so great as is generally imagined.

Attempts have been made in the past to produce a satisfactory side-valve aero engine and most of these have failed, either on account of poor volumetric efficiency or over-heating and distortion. My own idea of a possible solution of the problem is the use of small cylinders and high revs. to maintain output. I am aware that "Indicator" is not in favour of the latter, but I should add that a simple reduction gear would ensure reasonable airscrew efficiency and quietness.

It would be interesting to learn what are your readers' views on this subject. I am prepared for the scathing comments of "amateur designers" which are sure to follow!

Claygate, Surrey. SMALL FOUR.

TWO NEW BOOKS

Why Aeroplanes Fly ("The March of Time" Series), by Arthur Elton and Robert Fairthorne. Longmans Green and Co., Ltd., 29, Paternoster Row, London, E.C.4. 2s. 6d.

DEFINITELY a book which is different. Although certainly not childish, it gives the theory of flight from first principles without a single mathematical symbol. "Now we have to get from kite to aeroplane. To do this, we must find something else besides a string to do the pulling. What other things pull? Horses pull by putting their hoofs on the ground and leaning forward. Then they pause, lift their hoofs on a pace, and lean forward again. Steam engines and petrol engines can be made to pull. They have tubes (called cylinders) with rods and plungers (called pistons) which slide backwards and forwards inside them."

After chapters on Air, How Aeroplanes were Invented, and Making the Aeroplane Obey its Pilot, we have Different Ways of Using Aeroplanes: "Flying is usually expensive. In commercial machines with an ordinary speed of about 130 m.p.h., each passenger needs about 40 h.p. to keep him in the air, and uses about 20 gallons of petrol an hour. A big commercial aeroplane costs about 15s. to buy for every pound of its weight. This means about £770 a passenger. Insurance is expensive, and compulsory. An aeroplane costs a lot to keep in good repair—particularly if it is more than a few years old."

The book gives the impression of "1066 and all that" in style, but this is certainly not detrimental to it. Numerous photographs and simple diagrams illustrate the chapters.

Flight to Hell, by Hans Bertram. Hamish Hamilton, Ltd., 90, Great Russell Street, London, W.C. 10s. 6d.

THIS is the story of a young German who set out on a good-will flight in a Junkers seaplane across Asia to Australia, and the experiences encountered by himself and his co-pilot before a night take-off for Australia. Their subsequent disappearance for fifty-three days in the Australian Bush gives the name to this book. The rescue at the last moment by Aborigines and return to civilisation reads more like fiction. Being a direct translation from the German the reading suffers the usual limitations of language in such cases; it does not, however, prevent it being a quite thrilling record of most unusual experiences.

THE NEW TECHNIQUE

A Few Notes on the Use and Misuse of Flaps : A Modern Development Requiring Special Consideration

BY this time the majority of civil pilots, at any rate, whether amateur or professional, will have obtained plenty of experience of flaps and of their effects. There are, however, the newcomers to be considered, and even the experts may not have considered all the theoretical effects and the practical repercussions of these effects.

It should not be necessary to stress the facts that the pilot who is not accustomed to the use of split flaps will find a purely psychological difficulty at first in holding the very steep angle of glide which is necessary to retain a normal air speed; that the change of attitude during the hold-off and landing is pronounced enough to worry the uninitiated; and that an ample overdose of speed is advisable until this change of attitude can be made accurately with a single continuous movement of the control column. The more efficient the flaps the more rapid is the deceleration after flattening out.

Very few machines have yet been fitted in standard form with slotted flaps, so I will concentrate solely on the more elementary effects of the normal split trailing-edge flap. The former, in fact, increases the lift of a wing with a relatively small increase in drag, while the latter increases the drag with, usually, much less important increase in lift. Slotted flaps, consequently, require a different technique again, since they are designed to reduce the stalling speed rather than to steepen the approach angle. A combination of the two may eventually provide the final solution to the problems of rising landing speeds.

Experimental Results

However obvious the gliding and landing effects may be, a few figures will interest any pilot who has not experienced or does not expect to experience slight initial difficulty during the approach. Last year the N.A.C.A. published some notes on the use of flaps as fitted to a Fairchild 22. With this machine the normal flaps-up glide path was found to be 6 deg. below the horizontal and the nose had to be raised through an angle of 11.7 deg. to affect a three-pointer. When the flaps were down the glide path was 13.7 deg. below the horizontal, and the nose, therefore, had to be raised through an angle of 26 deg. In the case of this machine the attitude on landing was some 12 deg. more nose-high than it was possible to hold in a steady stalled glide. Consequently, if a wheel landing was to be avoided, the final control movement had to be made more abruptly and from a higher speed.

Usually, the tendency of the newcomer is to glide too slowly, and in many types this fault is aggravated near the ground by the fact that the aileron control is often improved at low speeds. The result is that, if the checking process is then carried out gently, the machine sinks violently on to its wheels without attaining the three-point attitude at all. In some cases both the nose and one wing will drop suddenly as the control column is brought back.

Another fruitful source of trouble concerns the use of the engine to stretch the glide while the flaps are down. In fact, a flapped machine should, if "rumbled" at all, be motored almost on to the ground. The engine will hold the nose up while the machine is retaining its normal gliding speed and, naturally enough, if the throttle is closed suddenly, the speed will fall away before the nose has

A typical example of split flap as fitted, in fact, to the unlucky Clouston's Speed Six Hawk. The *Flight* heading picture is of the well-flapped Series II Airspeed Envoy in the act of landing at Heston.

had time to drop again. It is usual to fly in with less and less motor until the actual moment of hold-off, when the throttle is fully closed. If the engine is used only for a short time during the glide, the nose must be forced down immediately the throttle has been closed.

In one or two cases split flaps have a very pronounced effect on the stalling speed of the machine, though usually they do not reduce this to any very remarkable extent. I can think of one type, however, on which the flaps-down and flaps-up stalling speeds differ by more than 10 m.p.h., and in the case of the Percival Gull this difference was given in *R. and M. 1697* as 6½ m.p.h. when fully loaded. If the difference is more than, say, 5 m.p.h. there is another possibility to be considered. When the flap gear is manually operated it is usually possible to use the flaps instead of the engine for the purpose of varying the gliding angle while approaching a small field or aerodrome, and it is possible to get into serious trouble if the machine is being brought in very slowly.

Imagine, for instance, that you are flying a machine which stalls at 40 m.p.h. or 50 m.p.h. when the flaps are respectively down or up. You are gliding, perhaps accidentally, as slowly as 49 m.p.h. with no engine, with lots of aileron control, but with only just enough elevator control to hold the necessary attitude. It is seen that the machine is going to undershoot by a small margin; the flaps are raised quickly. The machine promptly stalls. If there is still an ample margin of height the nose will simply drop, speed will be gathered and you *may* get into the field. If, on the other hand, the fact that you are undershooting has not been realised until the machine is just short of the boundary hedge, the raising of the flaps will do nothing but precipitate the affair nose first into this hedge. Since one can and does glide steeply and quickly when the flaps are down, this source of trouble is not likely to be common, but it is a possible one and should always be considered.

The effect on the elevator control of lowered flaps varies with every different machine. In some cases there is a gentle fore and aft pitching movement when the flaps are down and the machine is being glided very slowly; in others the fore and aft trim is very slightly affected. Such effects must be discovered by the pilot himself.

H. A. T.

A NOCTURNAL UNDERSHOOTING

By a NAVAL OFFICER

EARLIER in the day the pilot of one of our aircraft had promised to take me up night flying; but before the machine was due to leave he changed his mind and took someone else instead—someone who could be of some use to him and navigate if he got lost.

With interest quickened through knowledge of what I was missing, I watched this particular aeroplane take off and circle round the ship. From my vantage-point in the port navigation bridge I voiced a moan, as long as from here to to-morrow, that I would never get a chance of night flying again. Landing on an aircraft carrier's flying deck is a great thrill at the best of times, but for a non-executive officer to experience it at night-time it would be a great feather in his cap. I thought of the line I should be able to shoot for years over the glass of gin in the wardroom, or later in life in the club bar. It was such a good night, too, for flying; a fairly marked horizon, a sickle moon, stars in the heavens, only a moderate sea (an important point, this, in case of engine failure) and sufficient wind speed over the deck to make things comfortable for landing-on.

* * *

From away up in the darkness overhead a white light winked. "He's made his letter, sir," said the shadow signalman near me. "Give him green" replied the Wing Commander, and immediately rapped out the order "On floods!" The signalman meanwhile directed a miniature green searchlight at the aeroplane to tell the pilot that the ship was ready to receive him.

The flight deck became a pool of subdued light outlined by dim bulbs marking the "palisades," the tall fences that prevent a swerving machine falling into the sea. The aeroplane approached lower and lower, the red and green navigation lights on its wing tips waving in the bumpy air astern of the ship as if the machine were balancing on a tight rope. Suddenly the lights dropped and disappeared behind the after end of the flight deck. "Gosh," a voice ejaculated, "he's too low!"

There was a resounding impact; a spray of sparks flew into the air. The machine had hit the end of the deck with terrific force, disintegrated and fallen into the sea. Someone gave an order; the ship went astern. Scurrying signalmen dashed to the searchlights; and in an instant their long-fingered beams opened lighted pathways to port and starboard. Messages flashed between the ship and the attendant destroyer.

A bugle sounded. Bos'ns' pipes heralded the order "Cle...aaar lower deck, A-waaay starboard cutter." Sailors clattered up steel ladders to man the boat. Groups of men off watch, in "night clothing," leaned over the side scanning anxiously the disturbed sea. Someone said "Only the propeller and engine gearing dropped on the quarter-deck. The rest of the machine bounced off and sank in a couple of minutes." Overhead aircraft circled the ship and dropped flares suspended from silken parachutes, which cast widening circles of bright light as, infinitely slowly, they approached the sea—a heartening sight to us watchers, though our optimism grew less as each fading light failed to reveal any sign of the aircraft or her crew.

The starboard cutter was manned and lowered in record time. The shock of a final drop of twenty feet into the trough of a Mediterranean swell—a slight error, this, on someone's part—only gave the boat's crew an added zest to their oars.

Happy Ending

I saw a whaler shoving off from the destroyer and in the searchlight's rays could just discern the swimmers being hauled on board. A message from the destroyer "Have picked up three men, please send doctor" was almost too good to be true and filled us with joy. Our ship's surgeon, with his first-aid bag slung over his shoulder, hurried down the Jacob's ladder into the cutter. "Give way together" ordered the steady voice of the coxswain. Soon the cutter was alongside the destroyer, and willing hands hauled the officer on board. A signal "Patients suffering from shock, no apparent injury," sent a wave of relief over us.

The other aircraft landed-on safely, and, the exercises complete, we returned to harbour.

Yes, I had undoubtedly missed an experience through that last-minute change.

MEDWAY AFTERNOON

The First Empire Boat Leaves Her Birthplace

By H. F. KING

PREOCCUPIED and earnest with the urgency of Expansion, the Industry allows little time for downing tools, for contemplating new achievements and prospects, or for dreaming day-dreams of the future. How easily can eyes become so used to the confines of the drawing-board, the panel beneath the riveting tool, the foot of fabric under the spray, that when raised to appraise a product of united effort they are unable to focus clearly and are dropped once more to the allotted task, seeing, but not looking; intent, but not studying; foreseeing, but not visualising.

But the element of romance to be found in the growth of any great industry which benefits mankind is very much alive in aviation, and there are times when, seemingly, circumstances conspire to manifest this intrinsic beauty.

Last Thursday afternoon I stood on a bank of the Medway and was shown a picture, modern in treatment, but dignified in its simplicity, with the characters unaware that as they went about their tasks they fitted perfectly into a great symbolic canvas.

* * *

Canopus, the first of the fleet of Short Empire flying boats for Imperial Airways, is about to leave for service in the Mediterranean. She lies moored off Short's jetty with the mellowest of autumn sunlight, dominant over the river mists, tinging her metallic hull where the towering vertical sides merge with the turtle decking, catching the blades of the four airscrews as the dark, sluggish Medway swings her slowly about her buoy. Half a mile across the river, opposite the venerable Keep, lies a sister ship, the *Caledonia*, planned as a special long-range machine, with a swan-like Service Singapore alongside, silver-grey against the wet, black mud banks of the farther shore.

A waterman awaiting baggage to ferry out to *Canopus* glances up as a big biplane throbs high over the river. Surely not one of the four-engined Singapores he tends almost daily; but, of course, a Scapa down from Felixstowe bearing a crew to ferry away the Singapore moored with *Caledonia*. A word of wide application, ferry. . . .

The Scapa sweeps quietly round and down, spluttering in beyond the works with the reflection of her planing bottom showing larger and more distinctly in the water, holding off, then digging her keel firmly in and spurting back two white plumes toward the bank. A burst of starboard engine and she comes nosing up toward *Canopus*, to be moored close by.

Ashore the scene is kaleidoscopic; the lounge suits of officials, overalls of girls and shop-hands, the dark blue and gold of Imperial Airways uniforms, the lighter blue of the Service. Everyone is doing something or going somewhere—reading papers, signing papers, borrowing papers. . . . *Canopus* is leaving soon. . . . What time is *Canopus* going? . . . . Landing on the Seine, eh? . . . . *Centaurus* might be launched about four. . . . Well, that's the third. . . . Six off that last print. . . . Doesn't that Scapa look small beside *Canopus*? . . . . News-reel van, look, on the jetty. . . . Yes, that's Major Brackley. . . . Bailey is the pilot, isn't he? . . . . She touches down at about seventy, I believe. . . . Yes, that's her, taxying to test the Sperry. . . . Oh, he's down here getting used to the boats . . . from Imperials. . . .

And so they chatter on. Little time for thoughts of Empire-building, Imperial communications, and the most magnificent marine aircraft yet flown. Everyone is doing a job of work, but work which is building a dream, a dream just as romantic as a picture of a colourful old English dockyard, with yeomen craftsmen hammering oak into stately ships for merchant adventurers. It is a new dream of Empire on a framework of aspect ratios, Alclad sheeting, payload/horse-power ratios, boost pressures, cruising speeds and artificial horizons. Sometimes they must think about it and must feel very proud.

By the jetty is a pair of youngsters, grimy from the shops. The smaller stops, wide-eyed, as *Canopus* swims majestically about the river testing her Sperry equipment. So does the taller. But suddenly he becomes aware of the presence of groups of Rochestrians. Mustn't look as though he'd never seen a flying boat before. Didn't he work at Shorts? Well, "Come on, George, don't dawdle. You'll see twenty-six more of them." And, out of earshot of the citizens, "What time are they launching *Centaurus*?"

A news-reel camera is churning away before a group comprising Mr. Short and the crew of the *Canopus*. The film will be flashed momentarily before millions. If the commentary is good several hundred thousands may gather roughly what it is all about. A few thousands may see in it the opening of a new chapter in the romance of commerce.

Ship's Papers

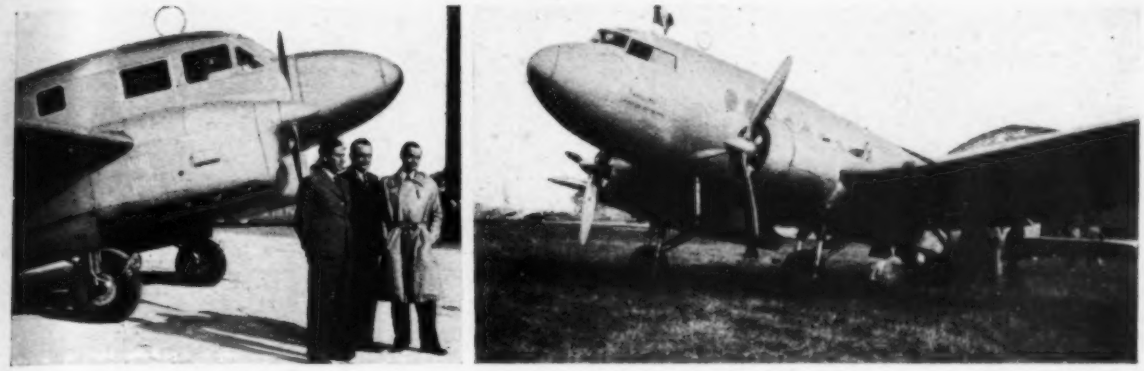
Major Brackley reaches out to receive a paper proffered by an Air Ministry official—the first of twenty-eight new aerial merchantmen has been granted its certificate of airworthiness. Her crew is rowed aboard. Hatches are closed. The shining De Havilland screws kick convulsively and become a quartet of shimmering steel-swept discs. The news-hawk Puss, Leopard and Dragonfly in attendance above show more interest as *Canopus* rides out into the river, taxying and turning to warm her engines. Close in to the southern bank she slows down, her bows pointing to give her a clear run across the bend beyond the works. Then thirty-six hundred horse-power become thrust. The sun, getting lower and redder, touches the great wings in benediction as she thunders up across the flat Kentish countryside.

The Scapa and Singapore cast off and leave noisily, mumbling away to themselves into the distance.

A tractor urges back the massive hangar doors, revealing *Centaurus* on her launching chassis with a row of towering hulls as a background. And the river scarcely calmed from the wake of one great boat, receives another of the family whose keels, christened in the muddy Medway, will know clear, tropical seas, the North Atlantic swell, and the waterways of Old and New Worlds.

PARIS–SAIGON–PERHAPS

Will There be a Claimant for the £17,000 Prize in the Race to French Indo-China and Back?



Both Goelands are already out of the race. This (left) is one, with its crew—Michelette (W/T. operator), Arnoux and Japy (pilots). On the right is the Breguet Fulgur.

THE three all-French entries for the 14,700 miles French Aero Club race, "toed the line" at Le Bourget Airport last Sunday. A large crowd had assembled when MM. Challe and Brill took off, at 6 a.m., flying a Caudron Goeland with two supercharged 250 h.p. inverted six-cylinder air-cooled Renault engines, giving a cruising speed of about 175 m.p.h. at 6,500ft. The range is over 1,800 miles carrying 1,200 litres (approx. 260 gallons) of petrol, and the total weight, 7,710lb.

Some two minutes later Japy and Arnoux took the air on another Goeland, with two normally aspirated, six-cylinder Renault engines of 220 h.p. The cruising speed in this case is about 162 m p.h. Weight and range differ little from the above. These two aircraft are of the low-wing cantilever type fitted with flaps and retractable undercarriages.

The third and last aircraft to take off, a Breguet Fulgur, flown by Detroyot and Durmon, is powered by two supercharged Gnome et Rhone, K14 No. (950 h.p.) fourteen-cylinder, two row, radial air-cooled engines, rated at 6,000ft. A fuel capacity of 3,500 litres (approx. 770 gallons) gives a range of about 1,250 miles at a cruising speed of 206 m.p.h. The maximum speed is given as 240 m.p.h. The construction is all-metal monocoque, as compared with the rectangular, plywood-covered internally braced Goeland fuselages. The total weight of the Fulgur is 18,960lb.

The Air France Mediterranean route was followed via Athens, then across Persia to the control at Baghdad. The normal air route was taken to Karachi, the next control point; and from there via Calcutta, Rangoon, and Bangkok to Saigon in Indo-China, where a compulsory forty-eight hours' rest was to be made with aircraft under lock and key, except for four consecutive hours allowed for repairs. An extra twenty-four hours may be granted in case of night take-off.

Japy and Arnoux, the leaders, were forced to retire at Karachi on Monday with a damaged wing, due to undercarriage failure. The Fulgur, proceeding after a forced landing for petrol at Corinth, left Baghdad at 1.36 p.m. on Monday, MM. Challe and Brille hoped to restart on their Goeland on Tuesday.

Objets d'art and 1,800,000 francs (over £17,000) prize money are offered, while the winning machine (if any—the early troubles suggest a complete fiasco before the race has run its course) will be bought by the French Air Ministry for 1,200,000 francs if the owners wish.

LORD NUFFIELD'S CASE

LORD NUFFIELD'S statement, made last Thursday, on his difference of opinion with the Air Ministry has already received such wide publicity that there seems little need to repeat it in full here, but a brief summary of his chief points may be found useful for reference in conjunction with the leading article on page 427.

Lord Nuffield's statement, which included the reading of correspondence, showed that from time to time, following the inception of the Wolseley aero engine factory in 1929, attempts were made to interest the Air Ministry, but to no avail.

In July, 1935, Lord Nuffield sought an interview with Lord Swinton (then Sir Philip Cunliffe-Lister), the Air Minister. Lord Swinton, in reply, gave his reasons—business in the House, committee work, etc.—for not being able to see Lord Nuffield on the day suggested, but indicated no alternative date.

At a later date, however, Lord Nuffield was requested to see Lord Weir—acting as adviser to the Air Ministry in connection with the expansion—and Lord Swinton. He offered to do anything he could in the interests of the country, stating that at his own expense he would obtain designs for and manufacture a well-known and approved American type of aero engine or the Bristol engine in order to augment equally the supplies of aero engines. This offer was not accepted.

Lord Nuffield, in his statement, then turned to "This shadow scheme."

"Right from the beginning," he stated, "I was against this scheme because in precision engineering of the nature involved in aero engine manufacture unity of control, in my judgment, is essential, and as a practical engineer I could not see this shadow scheme developing with the efficiency and speed that are essential.

"My contention always has been that this shadow scheme is not a scheme that would be satisfactory. It is sufficiently difficult to make aero engines in one factory alone. What will be the result of making engines in parts in seven factories, I really do not know.

"It is not a workable scheme, and this is one of my reasons for not coming in. My main reason is that I have already an aero engine factory and they do not seem to think that I am fit for it.

"Anxious to help, however, I offered to build 2,000 Bristol engines in the Wolseley aero engine factory. I want to emphasise that there was no haggling over any question of price, as I see has been suggested recently.

"I offered to build these engines at the price the Air Ministry were then paying, so that there could be no question of excess profit or anything of that order. This offer was turned down."

Lord Nuffield went on to say that apparently the Air Ministry next wished him to come into the scheme by putting up a new factory at Government expense, though he already had an aero engine factory standing there doing nothing.

Finally, Lord Nuffield's lengthy statement dealt with the closing down of the Wolseley aero engine plant, and a telephone call to the Air Ministry on August 26 last informing them that the cessation was taking place. The very next morning, alleged Lord Nuffield, a request to tender for 300 Wolseley engines was received.

THE ROYAL AIR FORCE

SERVICE NOTES AND NEWS — AIR MINISTRY ANNOUNCEMENTS

SIR PHILIP SASSOON

Sir Philip Sassoon, Under-Secretary for Air, arrived at Croydon by air on Thursday last, on return from a tour of inspection of R.A.F. stations in Egypt, the Sudan, and Kenya.

H.M.S. *FURIOUS*

The aircraft carrier *Furious* is to undergo another refit, at Devonport. The lower flying deck will be built up, as this is no longer used.

THE AIR MINISTRY

Extra accommodation for the Air Ministry is being acquired in No. 336-337, Strand, formerly Marconi House.

COMMISSIONS FOR EX-APPRENTICE CLERKS

The undermentioned ex-apprentice clerks have been granted permanent commissions in the stores branch:—Corporals Carle, F. G., and King, F. B.

No. 139 (BOMBER) SQUADRON

No. 139 (Bomber) Squadron will be temporarily equipped, on formation, with light bomber type of aircraft.

FORMATION OF STATION FLIGHT

A station flight will form at Eastchurch on November 1.

R.A.F. STATION, SINGAPORE

The R.A.F. Station, Singapore, will be renamed "R.A.F. Station, Seletar," with effect from November 1.

CENTRAL FLYING SCHOOL CATEGORIES

The undermentioned officers and airmen have been recategorised as under:—

A.2 to A.1.

Flt. Lt. R. L. Kippenberger.

B to A.2.

Flt. Lts. J. L. H. Fletcher, T. P. Gleave, F. W. Stannard, F. S. Wakeham, Sergts. Barretto, F. W. P., Buchanan, W. G., Cox, P. C., Hellyer, C. W., Jones, J. H.

C to B.

Flt. Lts. J. F. Stephens and W. P. Sutcliffe, F/O. W. H. N. Turner.

No. 2. FLYING TRAINING SCHOOL

The undermentioned officers and airman pilots have been awarded special assessments, as shown hereunder, on completion of a course of flying training at No. 2 Flying Training School, Digby:—

Special Distinction

A.P/O. H. J. Garlick.

Distinguished Pass

A.P/O.s T. E. J. Fitton, A. R. L. Griffiths, and J. P. Owens, Acting Sergts. Arden, H., Lines, E. F., and Whitmore, L. A.

No. 4 FLYING TRAINING SCHOOL

The undermentioned airman pilots have been awarded special assessments as shown hereunder, on completion of a course of flying training at No. 4 Flying Training School, Abu Sueir:—

Special Distinction

L.A/C.s Harding, G. W., and Lowe, H. H.

Distinguished Pass

L.A/C.s Crawford, C. W., Acott, W. R., Poynting, E. G., Cargill, A. S. T., Chapman, N. S. C., Worth, J., and Perry, R. I.

No. 6. FLYING TRAINING SCHOOL

The undermentioned officers and airman pilots have been awarded special assessments as shown hereunder, on completion of a course of flying training at No. 6 Flying Training School, Netheravon:—

Distinguished Pass

A.P/O.s P. A. Gilchrist, E. G. Jones, and W. M. Penman, Corpl. Cox, R. W., L.A/C.s Bickenson, E. L. D., Carey, F. R., and Treves, S. L.

No. 8 FLYING TRAINING SCHOOL

The undermentioned officers and airman pilot have been awarded special assessments as shown hereunder on completion of a course of flying training at No. 8 Flying Training School, Montrose:—

Special Distinction

Acting P/O. R. S. Cannell and Leading Aircraftman Cabuzet, D. L. B.

Distinguished Pass

Acting P/O.s A. A. Dilnot, J. B. Flowerdew, R. E. Lovett, C. A. Richardson, and C. D. Tomalin.

No. 10 FLYING TRAINING SCHOOL

The undermentioned officers have been awarded special assessments on completion of a course of flying training at No. 10 Flying Training School, Tern Hill:—

Special Distinction

A.P/O.s A. Aitken, L. Aitken, and A. S. Forbes.

Distinguished Pass

A.P/O.s H. R. P. Bridgen, A. B. Greenaway, and D. H. Holmes.

No. 11 FLYING TRAINING SCHOOL

The undermentioned officers and airman pilot have been awarded special assessments on completion of a course of flying training at No. 11 Flying Training School, Wittering:—

Special Distinction

A.P/O. A. H. Smythe.

Distinguished Pass

A.P/O.s M. N. Crossley and A. M. Jardine, A./Sergt. Barrett, G.G.N.

TRANSFER OF OFFICERS TO THE RESERVE

The undermentioned short service and non-permanent officers should note that they become due, in April and May, 1937, for transfer to the reserve on completing their period of service on the active list:—

General Duties Branch

Flt. Lts. Ronald George Edmund Catt and Ronald Neville Clarke.

Dental Branch

Flt. Lt. William Vernon Anthony Denney, L.D.S.

Medical Branch

Flt. Lt. Hugh James Melville, M.B., Ch.B.

AIR DEFENCE FILM

It is expected that the film entitled "The Gap" will be presented to the public at the end of November, by Gaumont British Instructional Films. It will deal with every aspect of air defence. The replica of the Control Room, on which comment was made in *Flight* recently, will not, it is now stated, be an exact duplicate of the original.

NEW ARMAMENT TRAINING CAMPS

No. 4 Armament Training Camp will form at West Freugh, Stranraer, on January 1, 1937, on which date the station will be placed under the command of the A.O.C.-in-C., Training Command, in the Armament Group.

No. 5 Armament Training Camp will form at Penrhos, Pwllheli, North Wales, on January 1, 1937, on which date the station will be placed under the command of the A.O.C.-in-C., Training Command, in the Armament Group.

These aerodromes may be used with effect from December 7 for aircraft of personnel visiting the station on duty in connection with the opening. Only aircraft fitted with tail wheels will be permitted to land, and no facilities of any kind will be available. The aerodromes will not be available for general use until February 1.

FLYING ACCIDENT

The Air Ministry regrets to announce that A.P/O. William Dycer Coppinger lost his life as the result of a collision in the air which occurred at Peterborough on October 23, between two aircraft of No. 7 Flying Training School, Peterborough. A.P/O. Coppinger was the pilot and sole occupant of one aircraft. The pilot and sole occupant of the second aircraft, A.P/O. Patrick John Shaw Shaughnessy, is safe.

COLONIAL ALLOWANCE IN HONG KONG

The following are revised rates of colonial allowance (which have already been authorised) for officers and airmen serving at Hong Kong, with effect from September 1, 1936:—

	Married.		*Single.*	
	$	c.	$	c.
Officer	—	80	—	30
Warrant officer	—	50	—	20
Warrant officer, 2nd class	—	40	—	15
Flight Sergeant	—	40	—	15
Sergeant	—	25	—	10
Corporal and below	—	20	—	—

R.A.F. BENEVOLENT FUND

The usual meeting of the Grants Committee of the above Fund was held at Iddesleigh House, on Monday, October 19. Mr. Walter S. Field was in the chair, and the other members present were: Mrs. L. M. K. Pratt Barlow, O.B.E., Group Capt. C. H. K. Edmonds, D.S.O., O.B.E., and Air Vice-Marshal C. A. H. Longcroft, C.B., C.M.G., D.S.O., A.F.C. The Committee made grants to the amount of £309 2s. 5d. The next meeting was fixed for November 2.

ROYAL AIR FORCE GAZETTE

London Gazette, October 20, 1936

General Duties Branch

Flt. Lt. K. R. Warton is granted a permanent commission in that rank (July 7); Lt. O. S. Stevinson, R.N., is reattached to the R.A.F. as a Flight Lieutenant, with effect from October 8 and seniority of July 1.

The following Flying Officers are promoted to the rank of Flight Lieutenant on the dates stated:—R. H. E. Emson (June 19), H. P. Jenkins (September 28), J. R. Watson (September 30); R. G. Bowditch, H. M. Russell, N. D. Crockart, D. P. Lee, R. A. C. Carter, T. G. L. Gale, J. C. Pope, A. R. G. Bax, C. S. Byram (October 1); C. L. Dann, E. Shipley (October 3).

The following Pilot Officers are promoted to the rank of Flying Officer on the dates stated:—L. W. Saben, E. R. Bitmead, J. M. Thompson, R. J. B. Burns (September 16); J. R. Leggate (October 3); J. J. J. Page (October 10); A. R. Leggate, J. B. Brolly, W. H. Kearney (October 16); W. E. Carr (October 19).

Stores Branch

The following Flying Officers on probation are confirmed in rank (September 5):—L. Doyle, E. H. Free.

The following Pilot Officers on probation are confirmed in rank and promoted to the rank of Flying Officer (September 6):—K. T. Nicklin, M. C. R. White.

Accountant Branch

W/O. W. E. Hicks is granted a permanent commission as Flying Officer on probation with effect from and with seniority of October 6; Pilot Officer on probation W. G. Thorn is confirmed in rank and promoted to the rank of Flying Officer (September 16).

Medical Branch

J. H. Preston, M.D., C.M., is granted a short service commission as Flying Officer with effect from August 21, and with seniority of August 21, 1935.

Errata

In the *Gazette* of September 15. For Kennedy Theobold Butler Burns read Kennedy Butler Theobald Burns. In the *Gazette* of September 22. For Charles Auston Rotherham read Charles Auston Rotheram.

ROYAL AIR FORCE RESERVE

Reserve of Air Force Officers

General Duties Branch

The following are granted commissions as Flight Lieutenants in Class C on the dates stated:—Flt. Lt. F. E. Bishop, M.B.E. (R.A.F. Retired) (September 12); Capt. N. H. Dimmock, A.F.C. (September 17); F/O. E. J. Moule (September 23).

S. B. Ganthony is granted a commission as Pilot Officer in Class C (October 20); F/O. H. Perring is transferred from Class AA (ii) to Class BB (August 17).

The following Flying Officers relinquish their commissions on completion of service and are permitted to retain their rank:—E. C. L. Richardson (July 7); H. J. Phillips (August 16).

AUXILIARY AIR FORCE

General Duties Branch

No. 500 (COUNTY OF KENT) (BOMBER) SQUADRON.—C. G. Hohler is granted a commission as Squadron Leader and appointed to the command of the squadron (October 20).

ROYAL AIR FORCE INTELLIGENCE

Appointments.—The following appointments in the Royal Air Force are notified:—

General Duties Branch

Wing Commanders.—G. W. Bentley, D.F.C., to No. 209 (F.B.) Squadron, Felixstowe; to command vice Wing Cdr. C. R. Cox, O.B.E., A.F.C., 1.10.36. J. A. Sadler, to Headquarters, R.A.F., Mediterranean, Malta; for duty as Fleet Aviation Officer to the C.-in-C., Mediterranean Fleet, vice Wing Cdr. J. M. Robb, D.S.O., D.F.C., 21.9.36. Hon. R. A. Cochrane, A.F.C., to Special Duty List; whilst on duty in New Zealand, 2.10.36.

Squadron Leaders.—W. A. B. Savile, to School of Army Co-operation, Old Sarum; for Administrative duties vice Squadron Leader R. M. C. MacFarlane, M.C., 11.10.36. F. Woolley, O.B.E., D.F.C., to headquarters, R.A.F., Far East, Singapore; for Air Staff Intelligence duties vice Sqn. Ldr. G. C. Bladon, 9.10.36. C. W. Hill, to No. 1 (F) Squadron, Tangmere; to command, 2.10.36. W. M. M. Hurley, to No. 220 (G.R.) Squadron, Bircham Newton; to command, 12.10.36.

Flight Lieutenants.—J. Cherrill, to R.A.F. Station, Calafrana, Malta, 1.10.36. R. N. McKern, to Straits Settlements Volunteer Air Force, Singapore, 9.10.36. J. E. M. MacCallum, to R.A.F. Station, Kai Tak, Hong Kong, 9.10.36. G. M. Buxton, to No. 206 (G.R.) Squadron, Bircham Newton, 7.10.36. W. L. Freebody, to No. 139 (B) Squadron, Wyton, 2.10.36. N. G. Goodman, to Marine Aircraft Experimental Establishment, Felixstowe, 8.10.36. R. H. Harris, to No. 48 (G.R.) Squadron, Manston, 4.10.36. H. L. Patch, to R.A.F. Station, Andover, 11.10.36. F. B. Bristow, to Electrical and Wireless School, Cranwell, 9.10.36. D. H. Marsack, to Headquarters, R.A.F., Palestine and Transjordan, Jerusalem, 2.10.36.

Flying Officers.—J. Y. Humphreys, to No. 111 (F) Squadron, Northolt, 10.10.36. G. S. A. Parnaby, to R.A.F. Station, Calshot, 10.10.36. P. S. Hutchinson, to No. 11 (Fighter) Group, Uxbridge, 1.10.36.

Pilot Officers.—N. M. Hall, to Station Flight, Duxford, 1.10.36. C. E. Drapper, to No. 48 (G.R.) Squadron, Manston, 4.10.36. W. H. Biddell and B. E. Dobb, to No. 206 (G.R.) Squadron, Bircham Newton, 4.10.36. B. Bell, J. B. Russell and P. White, to No. 220 (G.R.) Squadron, Bircham Newton. W. C. Williams, to No. 17 (F) Squadron, Kenley, 30.9.36. A. L. Pitfield, to No. 57 (B) Squadron, Upper Heyford, 30.9.36. A. F. M. Sisley and R. A. McL. Watson, to No. 101 (B) Squadron, Bicester, 30.9.36. H. C. Daish, to No. 218 (B) Squadron, Upper Heyford, 30.9.36. D. P. Frost, to No. 45 (B) Squadron, Helwan, Egypt, 1.10.36. T. W. C. Fazan, to No. 208 (A.C.) Squadron, Heliopolis, Egypt, 10.10.36. M. H. de L. Everest, to No. 18 (B) Squadron, Upper Heyford, 8.10.36.

Acting Pilot Officer.—R. F. Clarke, to No. 11 Flying Training School, Wittering, 19.9.36.

Stores Branch

Flight Lieutenants.—F. W. Taylor, to Headquarters, Training Command, Market Drayton, 8.10.36. A. J. Howell, to R.A.F. Station, Mount Batten, 12.10.36. J. E. V. Tyzack, to Headquarters, R.A.F., Palestine and Transjordan, Jerusalem, 14.8.36.

Flying Officer.—R. W. Wallace, to R.A.F. Station, Singapore, 9.10.36.

Medical Branch

Flight Lieutenant.—R. G. James, to R.A.F. Station, Turnhouse, 10.10.36.

Commissioned Engineer Officer

Flying Officer.—J. K. Tough, to R.A.F. Station, Driffield, 28.9.36.

Commissioned Signals Officer

Flying Officer.—F. Wilmshurst, D.S.M., to R.A.F. Station, Bircham Newton, 12.10.36.

Chaplains Branch

Rev. J. H. Pellatt, M.A., to R.A.F. Station, Calshot; for duty as Chaplain (C. of E.), 1.10.36.

COMMERCIAL AVIATION

AIRLINES — AIRPORTS

THEIRS THE RESPONSIBILITY : To take the first of a new and world-known type out for service must be an anxious task. Here is the crew of *Canopus* in a photograph taken just before the start at Rochester. From left to right they are : E. J. Crowson (engineer), T. Vallett (radio operator), Major H. B. Brackley (Air Superintendent of Imperials), F. Hards (engineer), W. Bell (radio operator), C. E. Adam (purser), an unidentified pilot, and Capt. F. J. Bailey (Captain).

THE WEEK AT CROYDON

A "Canopus" Story : The Weary Steward : Trees, Regarded Aesthetically and Aeronautically : Weights and Measures

AS doubtless you have learned from other pages, the good ship *Canopus*, first of the Empire flying boats to go on service, left England for the East last Thursday. As is usual on such occasions, Major Brackley, Air Superintendent of Imperial Airways, made the trip with Capt. Bailey, the Master. "Timber" Woods, of Croydon Airways, Ltd., tells an amusing story of a fruitless journey to Rochester with a Dragonfly, carrying a newsreel representative who wanted to get air pictures of the big boat. It had been arranged for *Canopus* to throttle down for the shots to be made, but when the boat had taken off, "Timber" made vain efforts to get alongside. He then spoke to Croydon control and asked for a message to be passed to *Canopus* to put the brakes on. Maybe it was the wireless operator's watch below, or something, but anyway, no reply was received from the boat, and "Timber" was left lamenting in a vast and lonely sky as the huge boat dwindled in size.

Something which was a new one on most Croydon people was the good-looking little Koolhoven F.K.42 eight- or ten-seater which came in one day last week on an air ambulance job. The machine, a high-wing monoplane with engines (two Wasps) atop, was owned by Alpar, the Swiss company operating, amongst others, a Basle to Berne service.

A daily newspaper has an amusing fad at the moment for fixing pedometers to housewives, waiters and other indoor hikers. Last week one of the Imperial Airways' stewards was so decorated, and it was found that his duties on a flight to Paris, during which lunch was served, caused him to walk four miles, and on the way back, during a dinner flight, he walked three and a half. These, by the way, were not particularly busy flights from a steward's viewpoint. Probably five miles for a flight would be nearer the mark in the height of the busy season.

A passenger last week told me that one of the most magnificent sights he had ever seen—it was on one of those bright, sunny autumn days—was the serried masses of red, russet, gold and orange trees as seen from the air whilst flying up to Croydon from the coast. It was especially the grouping of mass after mass of colour in isolated spinneys or great stretches of woodland stretching away as far as the eye could see, until they mellowed and faded into the haze of distance, which was so attractive.

Toppage and Loppage

Talking of trees, there is a group on the south border of the aerodrome which, pilots say, have become a nuisance when taking off and a worse menace when landing at night. They are outside the airport boundary and the authorities disclaim any powers of toppage and loppage. "It is strange," say officials, "that you have never complained of them before." Perhaps the Air Ministry should consult the Ministry of Agriculture and Fisheries, who will confirm that trees, given time, actually grow taller.

Somebody wrote to one of the papers suggesting that excess baggage should be abolished and fares increased by 5 per cent. If that were so there would be nothing to prevent passengers moving house and home from one country to another by air, and besides, the average business man has reduced his luggage to a single suit-case which, when the contents are carefully chosen and the suit-case is one of those lightweight affairs marketed for the job, gives him everything he needs for an ordinary

business trip without much exceeding the free allowance of 15 kg. Excess baggage is a very legitimate source of revenue to an air traffic concern, more so even than on a boat or train, where weight does not matter and a great deal of space is available, for every kg. of excess baggage carried in an aeroplane could be replaced by paying freight or mail. Most firms reckon a passenger weighs between 70 and 80 kg., so five or six passengers' free allowance of baggage equals the weight of a passenger anyway, and you may work out the sum for yourself when, say, thirty-five passengers are carried.

Another point in the letter which puzzled me was a reference to passengers at airports such as Croydon, Amsterdam, and so on. The writer said that there is an air of casual uncertainty on the actual aerodrome and a feeling that it is up to the passenger to find the machine and make sure of its destination. Now, all passengers at Croydon are shepherded through the bottleneck, where their passports are returned to them, and there are officials of the companies on the tarmac to point out their machine to them. Incidentally, owing to the air passenger's inherent tendency to hide in a 'phone box or buffet until after the scheduled departure time, or even to wander away into the shrubberies in front of the main building under the firm impression that aeroplanes start from there, like birds from their nests, it is necessary to have eagle-eyed, fleet-footed officials functioning as "sheep-dogs." At Amsterdam, for instance, the whole thing is done by loud speaker in three languages, but I have known an Englishman, exceptional in that he understood the other two, calmly order more food from a waiter when the impersonal voice issuing from a trumpet above his head was imploring him to take his seat in the machine for London.

A. VIATOR.

Aberdeen to Norway

IT appears that the Norwegian Government has granted a concession to Aberdeen Airways for a service between Aberdeen and Stavanger. This service is expected to open on April 19 next year.

Heston's Future

FOR a considerable time interested persons have been wondering about the future of Heston airport and we learnt last week, with regret, that Airwork has instructed Alfred Savill & Son to proceed with the sale of some twenty-six acres of land lying to the east of the airport and separated from it by a public footpath. The company has no power to divert passengers from this footpath.

The possibility of laying out a major air terminus at Heston, linked with Paddington by a fast diesel rail-car service, has been under the consideration of the Air Ministry since September, 1935. But the period during which normal building operations could be held up in anticipation of this scheme has come to an end, and it is now no more possible for Airwork than for other owners concerned to withhold their surplus land.

It may or may not be in the public interest that Heston should henceforth be limited to normal dimensions. That interest has until now been safeguarded by reason of the fact that the Government possesses the power of compulsory acquisition of land required for aerodrome use, but if such power is not exercised prior to the date of sale it is probable that the land will be built upon. In that case Airwork will place such restrictions on the height of buildings as are necessary.

(*Editorial comment appears on p. 429.*)

The First—And After

AT 2.30 p.m. on October 22 *Canopus*, the first of the Short Empire boats, left the Medway on its journey towards the Mediterranean where it is to be used, for the time being, on the normal service between Brindisi and Alexandria. However depressing it may be to realise that its assistance is necessary on this service, the operational experience obtained should be invaluable when the time is ripe for the bigger operations.

Before its arrival there were three boats on this service, two Calcuttas (1927 vintage) and one Scipio. The second of the Calcuttas was that previously used for training at Hamble; this has been replaced by a Short Rangoon, the military version of the Calcutta.

Canopus was taken out by Capt. F. J. Bailey, with, as second pilot, Major H. B. Brackley, the air superintendent of Imperials, who was the first member of their staff to try out the new equipment. On that evening the machine landed on the Seine at Caudebec-en-Caux (N.W. of Rouen), where the Amiot works are situated. It was intended to proceed on the following day to Marseilles, possibly *via* Mâcon, on the River Saône, north of Lyons. Unfortunately fog in the Rhône Valley held the machine up, and it was eventually decided to take *Canopus* round by Bordeaux. Marseilles was actually reached on October 25. *Centaurus*, the third boat, will be ferried out in the course of the next week or so. The second boat, *Caledonia*, is, of course, fitted with long-range tanks for transatlantic experiments. It is probable that Capt. Cummings will be one of the first pilots to be assigned to this work.

HERALDING THE NEW ERA : The first of the Short Empire boats is now in the Mediterranean after being flown across France by Capt. Bailey and Major Brackley. This *Flight* photograph shows *Canopus* from a somewhat unusual angle ; the fully faired rear step and the forward sloping front step are noteworthy features of the hull.

Commercial Aviation

Germany and the Atlantic

THE D.L.H. flying-boats *Æolus* and *Zephyr* last week concluded their experimental flights across the North Atlantic and returned to Lisbon, whence they will by now have flown to Germany. Each boat has made two return flights from Horta, in the Azores, to New York, by way of the Bermudas.

An Airport for Dublin . . .

THERE is a strong possibility that Dublin will presently have a municipal airport, particularly as Irish Sea Airways is now a going concern. Under the provisions of the Air Navigation Act, power is given to local authorities to establish municipal aerodromes, and the attention of the Dublin corporation is being drawn to this.

Collinstown, on the north side of the city, is the site favoured by the corporation. There is a disused military aerodrome there, and the place is regarded as the best location for an airport. Extra land would, of course, need to be acquired.

. . . And for Aylesbury

WITHIN recent months a new company has been formed with the idea of developing an airport at Aylesbury. This company is known as Aylesbury Airport, Ltd., and its address is Aylesbury Aerodrome, Haddenham, Bucks.

The scheme was actually started by Mr. J. E. Coxon, who took over Chilworth aerodrome, Oxford, last year as a temporary measure. The site of the new aerodrome consists of 140 acres, an area which allows for a run of 1,000 yards in every direction. It is bounded by three roads and the G.W.R., and a portion of the site beside the railway has been reserved for manufacturers' use. The surface is being levelled by Hunters of Chester; the contract has already been placed for the large hangars and a smaller one should, by now, be complete.

Although the aerodrome will be six miles from Aylesbury, there is a regular bus service and Haddenham station is only a hundred yards from the position to be taken by the control buildings. The company, it is understood, has the full support of the local authorities.

"Farewell" Party

ONE of the most delightful, as well as one of the best organised Parties (the capital "P" is intentional) took place on Saturday, October 24, at How Green, Hever, Kent, the residence of Mr. and Mrs. Grahame Mackinnon. Actually it was organised by the Three Musketeers—Mr. Farey Jones, Mr G. Mackinnon and Mr. Jack Bryans, the founders of British Continental Airways, and some seventy-five members of the company spent one of the most cheery evenings of their lives, tinged, perhaps, with a certain melancholy (which only really came to a head next day) because this was the final farewell party of B.C.A. as such.

Owing to amalgamation with British Airways, B.C.A., as now constituted, ceases to have a separate entity. Sir Percy Grahame Mackinnon, chairman of the board of B.C.A., referred to the wonderful team spirit which had helped so much. Warm tributes were also paid to Mr. Farey Jones' leadership by various members of the staff. Sir Percy stressed the need for the same spirit as had existed in B.C.A. being transferred to the new company, and Mr. C. G. Grey aptly remarked in his speech that the gathering reminded him of a bachelor party just before the wedding. Seldom have we seen a gathering of people of all commercial ranks who, after the wear and tear of daily work together, so completely resembled a happy family.

The party was admirably organised, and even the cigarettes bore the company's initials. Large A.A. signs made it easy to get there, and more important, not impossible to get home, even though the hour was 4.30 a.m. and the weather definitely Q.B.I. Every guest was presented with a silk tie of the B.C.A. colours, blue and red stripe on a grey ground. Sir Percy Mackinnon was presented by the staff with a silver salver and silver ashtrays were presented to the Three Musketeers.

During dinner, somewhat to the alarm of those who on these occasions suspect their own eyesight when confronted with the unfamiliar, there was a brisk shower of golden rain outside the windows, and the letters B.C.A. appeared in vivid light and faded. The spirit which has inspired B.C.A. will live and be of value in the new company, which, by blending the best in both B.A. and B.C.A., should be capable of doing a very great deal for British civil aviation and for air transport in particular.

Ground Services and Air Transport

ON Friday, December 18, at the Exchange Station Hotel, Liverpool, Mr. H. J. Andrews, R.A.F.O., M.A.Ae.E., the Liverpool airport manager, will address the Manchester-Liverpool section of the Institute of Transport on "The Ground Services Essential to Safety in Air Transport."

Through to Hong Kong

LAST week the P.A.A. *Philippine Clipper*, on its scheduled crossing of the Pacific, carried on from Manila to Macao and Hong Kong. Since Imperial Airways already fly between Penang and Hong Kong it will be possible, when the transatlantic passenger service is started in 1938 or 1939, to fly round the world solely by American and English air services. Remember Mr. Ekins then!

The standard fare for the Pacific service from San Francisco to Manila is, as a matter of interest, £160.

The Terrifying "Medical"

ALTHOUGH intended primarily as a guide for medical officers when examining candidates for professional service or civil flying careers, the latest aeronautical publication from H.M. Stationery Office might interest the victims as well as the examiners. *The Medical Examination for Fitness in Flying* covers the whole business and tells the medical man exactly where to look and what to look for. It is interesting to notice that the consideration of an applicant's family history is given due importance, while the examiner is given loopholes for the exercise of his own discretion.

Qantas Regularity

DURING the five months prior to September, Qantas Empire Airways completed 34 scheduled eastbound services, arriving at Singapore on time after every trip. In the same period only two westbound services failed to maintain the scheduled time, so that, out of 68 services, 66 were completed as they should be. The D.H.86s, up to August 17, had completed 900,000 miles without a single forced landing.

Incidentally, the traffic figures show that full advantage is being taken of the service duplication. In February, March and April a total of 187 passengers was carried, while in May, June and July, after the duplication, this figure increased to 477.

The Railways Move in India

AIR services, as the final link in the co-ordination of transport which has gone much farther in Hyderabad State than in any other part of India, should shortly be established there. Building has already started on the Hyderabad airport where the work should be completed by January. There are to be six aerodromes within the State, and the services will bring Hyderabad within four hours of Madras and Bombay, and within eight hours of Delhi. The machines likely to be used will include four D.H. Dragons and two Gipsy Majors.

The scheme has been organised by Sir Akbar Hydari, president of the railway board, and Major E. W. Slaughter, agent of the Nizam State Railway, who has done so much to produce a model system of co-ordinated transport.

"652" Development

THE Avro 652, it will be recalled, was designed originally as a civil machine for Imperial Airways, and from it was developed the military version known as the Anson. After the Anson had been adopted by the Air Ministry its subsequent development for quantity production, together with certain alterations necessary to satisfy the exact requirements of the Air Ministry, took such a form that the resultant machine was very different from the original 652, and practically none of the original components remained unchanged. Then, subsequently, when the question arose of supplying further 652s to other civilian operators, it was necessary to develop another 652 from the then existing Anson, thus reversing the order of things.

There are a number of apparent differences between the new version of the 652 and the original machine as supplied to Imperial Airways. The shape of the tail unit, for example, has been revised; the machine stands noticeably higher on its undercarriage; and the engine nacelles are less bulbous than before.

One of the latest 652s is at present being prepared for delivery to the Egyptian Government, and is now at Martlesham. The new performance figures are not yet available.

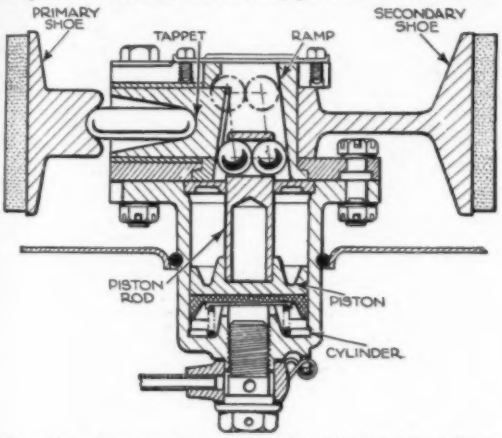
AN INTERESTING BRAKE

Features of the Latest Bendix Pneumatically operated Type

MANY people not actively connected with aircraft manufacture fail to appreciate how comparatively recent an innovation is the fitting of wheel brakes, and to some of them this extract from *Flight* of March 22, 1928, may come as a surprise: "At the moment there is not, as far as we are aware, any British aero wheel brake on the market, but aero wheels suitable for the fitting of brakes, and the brakes themselves, of American origin, can now be obtained from Bendix-Perrot Brakes, Ltd."

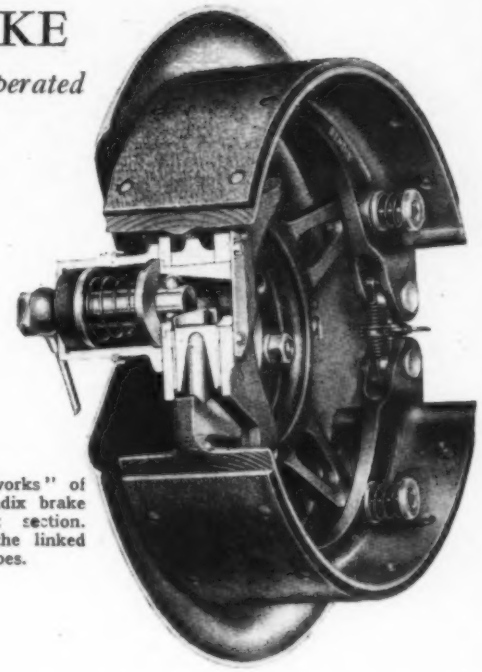
That statement adds interest to the details of the new Bendix air-operated brake, which is of an interesting yet simple design, and for which are claimed the advantages of low weight in the complete installation, effortless operation by a thumb trigger, a mechanical brake shoe, the operation of which is thus unaffected by heat generated, and a progressive servo-type action.

The brake shoe operation is shown in the diagram below. The cylinder bolted to the backing plate houses a piston, the



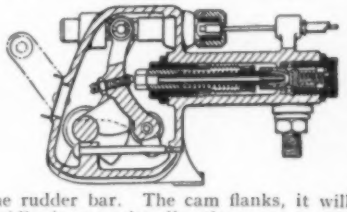
When the piston moves along the cylinder the primary shoe is pressed outwards.

rod of which carries two hardened steel balls which are free to slide transversely in it. When, on application of the brake, compressed air forces the piston along the cylinder, the balls slide up the ramp on one side and displace the tappet outwards on the other side, bringing the primary brake shoe into operation. The friction between the drum and primary shoe forces the latter against the secondary shoe, with which it is linked, and this in turn is forced against the drum. The secondary shoe is anchored at its farther end to the backing plate, to which, therefore, the breaking torque is transmitted.



The "works" of the Bendix brake in part section. Notice the linked shoes.

The operating trigger, situated on the control column, is connected by Bendix cable to the control unit. The rudder bar is connected by a lever to the control unit, and on moving the bar the braking effect on the outer wheel is decreased while that on the inner wheel remains substantially constant. This effect is obtained from two relay valves operated by two levers through adjusting screws at the mid points bearing on the valve plungers, as shown in the diagram below. To one end of each lever is connected the trigger cable; the other carries a roller contacting with the face of a cam, the shaft of which



The relay valves and cams as at "brakes off" and "rudder central."

carries the lever to the rudder bar. The cam flanks, it will be seen, fall away rapidly in opposite directions.

This braking system is manufactured by Bendix, Ltd., Tyseley, Birmingham, who have issued an extremely informative and well-illustrated booklet in connection with it.

Forthcoming Events

October 30. Croydon Airport Staff Ball.
November 3. R.Ae.S. Students' Section Lecture†: "Technical Aeronautics in Australia," by Mr. J. V. Connolly.
November 6. Norfolk and Norwich Aero Club: Annual Ball.
November 12. R.Ae.S. Lecture: "Skin Friction," by Dr. F. W. Lanchester.
November 13-29. International Aero Exhibition, Paris.
November 19. R.Ae.S. (Coventry Branch) Lecture: "The Lorenz System," by Mr. F. Tomlinson.
November 19. R.Ae.S. Lecture*: "Aerodrome Design," by Mr. Nigel Norman.
November 20. South Coast Flying Club: Dinner and Dance, Grand Hotel, Brighton.
November 20. Eastbourne Flying Club: Dinner and Dance.
November 27. Lancashire Aero Club: Annual Ball. Palace Hotel, Buxton.
December 1. R.Ae.S. Students' Section Lecture†: "Stressed-skin Construction," by Mr. C. Moore.
December 3. R.A.F. Flying Club: Annual Ball at Grosvenor House, Park Lane.
December 10. R.Ae.S. Lecture*: "Civil Flying Boats," by Mr. A. Gouge.
December 17. R.Ae.S. Lecture*: "Profile Drag," by Prof. Melville Jones.
December 18. London Aeroplane Club: Dinner and Dance, Park Lane Hotel, London.
1937
January 14. R.Ae.S. Lecture*: "Magnesium Alloys," by Dr. C. H. Desch.
January 28. R.Ae.S. Lecture*: "Plastic Materials," by Dr. N. A. de Bruyne.
February 3. Royal United Service Institution Lecture: "The Anti-Aircraft Defence of Great Britain," by Maj.-Gen. R. H. D. Tompson.
February 11. R.Ae.S. Lecture*: "The Automatic Pilot," by Mr. F. W. Meredith and Mr. P. A. Cooke.
February 17. Royal United Service Institution Lecture: "Air Force Co-operation in Policing the Empire," by Air Comdr. C. F. A. Portal.
February 18. Civil Aviation Service Corps Dance, First Avenue Hotel, London.
February 26. Brooklands and Associated Clubs: Dinner and Dance, Mayfair Hotel, London.

*All R.Ae.S. lectures take place at the Royal Society of Arts, 18, John St., London, W.C.2, at 6.30 p.m. Admission is by ticket obtainable through a member.
†R.Ae.S. Students' Section meetings take place at 7 p.m. in the R.Ae.S. Library.

HERE and THERE

Ultra-light Engines : New Works Equipment : An Airscrew "Shadow" Factory
News of Trade Developments

Compact Power

READERS interested in motor cycle engines which have been adapted for use in various types of light aeroplane might well pay a visit to the Olympia Bicycle and Motor Cycle Show, which opens at Olympia next Monday, and remains open until Saturday, November 7. Our associated journal, *The Motor Cycle*, will publish a complete report of the Show next Thursday.

A New Welding Electrode

MUREX WELDING PROCESS, LTD., Forest Road, London, E.17, have issued a pamphlet on the "Ironex" electrode, of the Murex extruded type. It is claimed that the special patented coating embodies a new and efficient principle of protection for the arc stream against atmospheric attack.

The constituents combine with the atmosphere about the arc and the products volatilise or dissolve in the readily removable slag.

Of the two metal losses in electric arc welding during deposition of an electrode, splashing and volatilisation, it is said that, with "Ironex" electrodes, loss due to splashing is exceedingly small while volatilisation is fully compensated for by the combination of metallic ingredients in the coating. Figures for practical experiments are included.

Inexpensive Storage Bins

BROWN BROTHERS, Ltd.'s new "Progresso" steel storage bins take the form of standardised units which may be built up to any size, single or double faced, in high stacks or low nests or, in fact, any convenient form.

Each standardised unit is divisible into any number of subdivisions without the use of tools, two loose dividers being supplied with each unit and additional ones being obtainable cheaply.

The price for this workshop furniture is extremely low—9s. 6d. per unit—and a substantial reduction in this figure is made for quantities. As an example, 6 units would form a stack 3 ft. wide by 4½ ft. high by 12 in. deep. With the dividers included with each unit, this would give 18 adjustable divisions, say, 12 in. × 12 in. The total cost with a top would be 54s., and with an additional half-dozen dividers at 2s. 3d., 24 divisions could be made each, say, 9 in. × 9 in.

The bins are marketed by Brown Brothers, Ltd., Great Eastern Street, London, E.C.2.

Anodising

IT may be recalled that in last week's issue there appeared an interesting note on the subject of anodising of tanks, with some observations on the process as carried out in the shops of Airwork, Ltd.

The wording of the paragraph may have conveyed the impression that Airwork, Ltd., was the only firm applying this treatment to tanks, which, of course, is obviously a wrong one. The claim made was that it was the only firm "of its type," i.e., one that specialises in aircraft repair, rebuilding and maintenance work. Among companies which carry out aircraft anodising work may be mentioned John Short, Ltd., and Technical Platings, Ltd. The former firm of aeronautical engineers, at its factory at Mousehold Aerodrome, Norwich, has had a large anodic plant in operation for some months. In addition to treating a batch of seaplane floats and other Fleet Air Arm components which it has made itself, the firm is handling a large amount of work for outside concerns, including bomb gear parts, compass bases, A.S.I. dials, pitot heads.

Technical Platings, Ltd., of Craig's Works, Luther Road, Teddington, are handling a very heavy volume of anodising business, some 700 tanks of various types being in hand at the moment, in addition to some tons of rivets and a wide variety of equipment such as bomb gear and gun mountings. Tanks of up to 2,000 gallons capacity have been anodised. Apart from anodising, this plant (which is one of the largest in the country, utilising 2,000 amperes of current) handles all kinds of plating work.

A Timken Gathering

PROMINENT British and French engineers were present at the annual British Timken dinner and cabaret held at the May Fair Hotel, London, on Tuesday of last week.

On the Screen

NOT a few flying folk are amateur ciné enthusiasts, while the more technically minded are apt to indulge in lantern lectures on aeronautical matters during the winter months. Both will find considerable interest in this week's issue of our associated journal, *The Amateur Photographer*, now on sale, which is a special number devoted to home cinés and lantern slides.

An Airscrew "Shadow" Factory

A FACTORY is to be built as soon as possible at Lostock Hall, near Bolton, Lancashire, which will represent a branch of the shadow industry in manufacturing variable-pitch airscrews. The staff will be trained to act as the nucleus of a much larger concern in the case of an emergency expansion.

When finished, the factory will be under the management of the De Havilland Aircraft Co., who are already producing V.P. airscrews small enough for 130 or 200 h.p. engines, and on the way to producing types suitable for absorbing 2,000 h.p. Each of the four Pegasus Xc engines of the twenty-eight Short Empire Flying Boats is fitted with a De Havilland three-bladed V.P. airscrew.

Small Tools

FORMING a complete compendium of the small tools manufactured by the English Steel Corporation, Ltd., at Openshaw and Sheffield, a catalogue recently issued by the company supersedes the sectional booklets previously issued. A well-bound 238-page publication, it is divided into sections covering milling cutters, end mills, gear cutters and hobs, reamers, broaches, drills, taps and dies, files, saws, lathe tools, and miscellaneous equipment. Practical advice on the use and maintenance of various tools is also given.

The English Steel Corporation now carry a stock of tool steels and tools which is possibly the largest held by any maker in the country, and most standard milling cutters, reamers and twist rolls can be delivered at once.

Manufacturers can obtain the catalogue on application to the Corporation at Vickers Works, Sheffield.

NEW COMPANIES

In the notes below, for reasons of space, the "objects" of new companies are usually somewhat abbreviated.

AVIATION & GENERAL PRODUCTS LTD.—Private Company, registered October 8. Capital, £5,000 in 5,000 shares of £1 each. Objects: to acquire the business of designers and constructors of and dealers in aircraft, and aviation appliances, etc. carried on by Aviation and General Products Ltd. at Woodside Lane, N. Finchley. The first directors are not named. Solicitors: Smallman & Son, 70a, Basinghall St., London, E.C.2.

TIMINAIR LTD. Private company, registered October 19. Capital, £1,000 in 4,000 shares of 5/- each. Objects: To manufacture, repair, and deal in aircraft of all kinds. The first directors are not named. Registered office: 79, Lombard St., London, E.C.3.

AERONAUTICAL PATENT SPECIFICATIONS

(The numbers in brackets are those under which the Specifications will be printed and abridged, etc.)

(Published October 29, 1936.)

9468. SOC. D'INVENTIONS AERONAUTIQUES & MECANIQUES S.I.A.M.: System for controlling the evolutions of an aircraft (454,490).
9544. MACDONALD, R.: Aircraft (454,556).
10223. MCLELLAN, A.: Altimeters, aneroid barometers, and pressure measuring instruments (454,443).
10094. GRIFFIN, E. G.: (Burnelli Aircraft, Ltd.): Aeroplanes (454,388).
17857. BARKER, G. G.: (Bendix Aviation Corporation): Brakes (454,330).

PUBLICATIONS RECEIVED

Sky Gipsy, by Claudia Cranston. Price 10s. 6d. George G. Harrap and Co., Ltd., 182, High Holborn, W.C.1.

Euphrates Exile, by A. D. Macdonald. Price 7s. 6d. G. Bell and Sons, Ltd. York House, Portugal Street, London, W.C.2.